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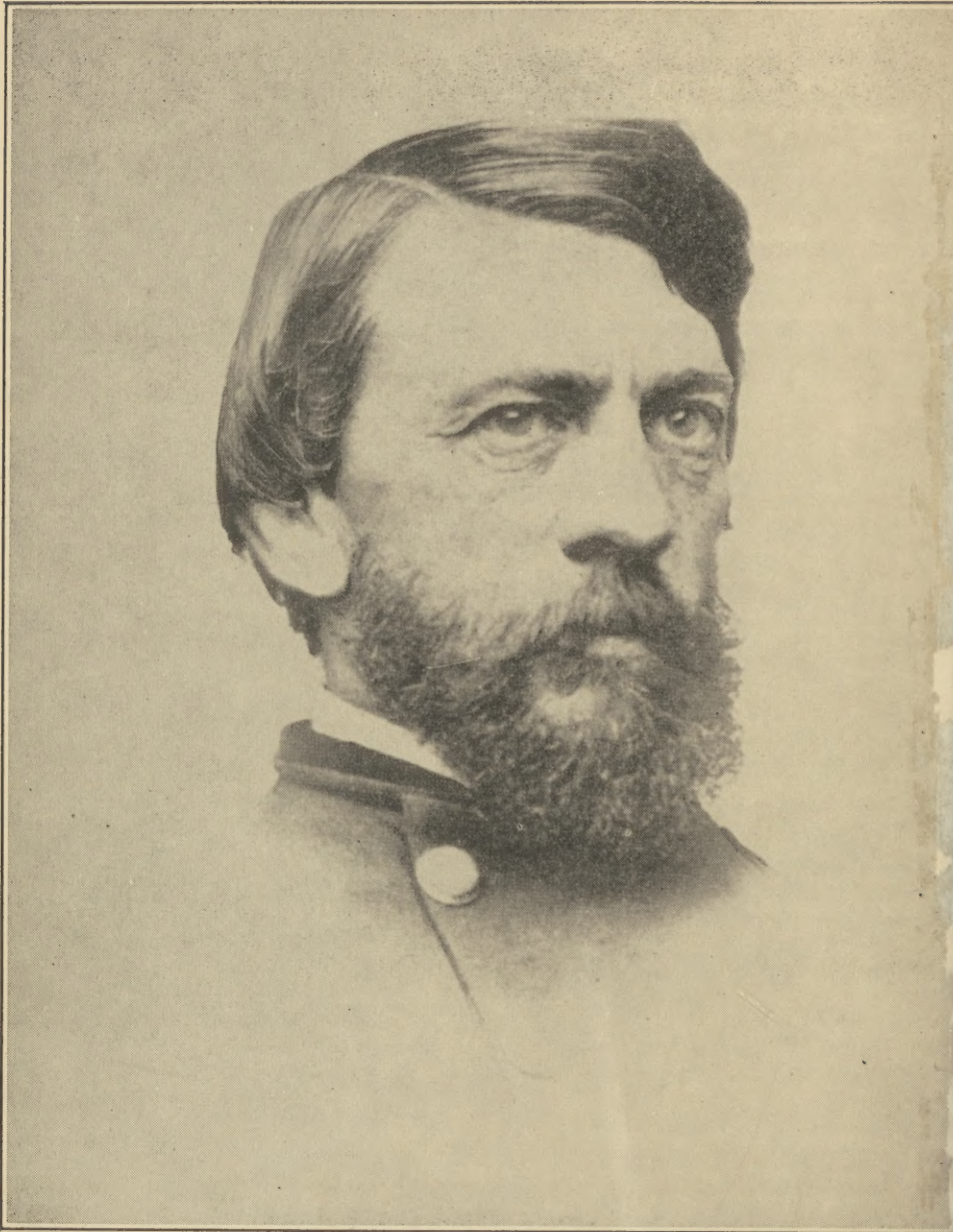
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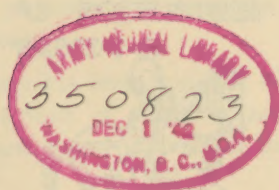
SURGEON JOHNATHAN LETTERMAN (1824-1872)

The Medical Officer who devised the plan of field hospitalization and evacuation which has influenced that service in every modern army.

Wille only

MILITARY MEDICAL MANUAL

5th Edition



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THE MILITARY SERVICE PUBLISHING COMPANY
HARRISBURG, PENNSYLVANIA

[1942]

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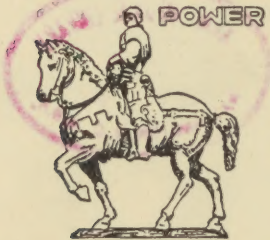
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FOREWORD

BY MAJOR GENERAL JAMES C. MAGEE

THE SURGEON GENERAL, U. S. ARMY

Earlier editions of this book have been a great help to medical officers, particularly those of the National Guard and Reserve forces.

The present issue has been modified, where necessary, to meet the requirements of current practice and may be accepted as a practical and reliable text concerning military medical matters.

PUBLISHER'S PREFACE

The purpose of this book is to present information of practical value to officers of the Medical Department of the Army of the United States. The sources of the subject matter are official publications of the War Department and instructional material published by the general and special service schools. However, no person is to conclude, because of the use of these sources, that this volume is in any sense "Official."

It is divided into the three divisions with which the medical officer must concern himself in the full sweep of his responsibilities. Part I contains military matters of which the medical officer should have knowledge; it is presented with special consideration of his requirements. Part II contains professional subjects peculiar to the responsibilities of the medical officer. Historical and other interesting data about the Medical Department are included. Part III contains complete and detailed information about the tactical employment of medical units in the field and includes the subjects of administration, supply, and mess management, with special reference to the problems of small units.

An extensive index of the entire volume is included to simplify reference to this fund of knowledge.

Grateful acknowledgment is made to the considerable number of officers whose work in preparing, editing, and reviewing has made this manual possible.

THE PUBLISHERS

MILITARY MEDICAL MANUAL

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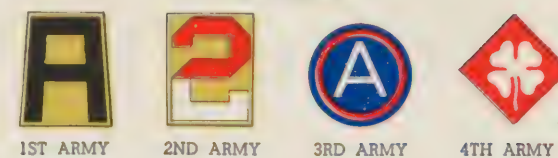
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TYPICAL INSIGNIA UNITED STATES ARMY

GENERAL HEADQUARTERS



ARMIES



CORPS



DIVISIONS



OTHER ORGANIZATIONS



CHAPTER I

THE ARMY OF THE UNITED STATES

"We are going to win the war and we are going to win the peace that follows."
—FRANKLIN DELANO ROOSEVELT.

INTRODUCTION

The days of prelude have ended. Japan and her Axis allies took the action which our wise men had foreseen but which public opinion could not accept. War was declared against us at a time when our every effort was to seek peaceful solutions. Their acts gave us a united people, and for that happy circumstance at a later time we may have full occasion to be grateful. The tragic events of December 7, 1941, and the weeks which followed brought many disappointments to the United States. But in the depths of those unwelcome experiences Americans began to show their true worth. Confidence in the successful outcome of the war has been freely proclaimed. Perhaps, even, it has been too freely proclaimed. Courage has been displayed by the American public to an extent which the thoughtful may have questioned. The example of the defenders of Pearl Harbor, of Wake Island, and General MacArthur's epic stand in the Philippines have gained the admiration which the events deserve. Our people have shown an abundant courage. Finally there is zeal, a new zeal, a tremendous zeal to do whatever is necessary to win this war—a condition which was quite dormant in the hearts and minds of too many citizens prior to Pearl Harbor. Shoulders which had been resting lightly against the wheels began really to push! These are the factors which make morale. The great making up of the National Mind has been accomplished. That it was forced upon a reluctant people by events they could no longer control is not a factor. The troubled and unhappy days of prelude are no more. Foolish arguments are beginning to blend into the past. Do you remember the weighty arguments about the Service Extension Act? The hubbub about limitations on service? Once they were hotly argued. They fade into the insignificance they have always deserved since the threats to the security of our nation are made clear to all. We have a war to win. If we do our jobs well, we will win this war. And this time, we propose to win the peace which is to follow.

In this war, thoughtful citizens will ask—how strong should America become? Should the armed forces be increased to seven, or ten, or more millions. Should we have fifty thousand or two hundred thousand airplanes? And how many tanks and guns? These questions are without meaning. America must become strong enough to make ultimate victory a certainty! We cannot afford to lose or risk losing. The strength we need to insure a peace of our own choosing will be created. Our enemies are strong and resolute. A tendency to complacency in our National viewpoints causes us to take these enemies too lightly. They, too, are resolved to win. They are prepared for this war and have chosen the time and place to wage it. We will win only by developing our full strength and placing it where it is needed.

This gigantic undertaking gives to the Medical profession a task which must strain its resources to the utmost. Vast numbers of officers and men must be trained, equipped, and taught to perform tasks which equal in importance those which are given to the arms and other services. In size alone, the Medical Department will excel by far the total strength of the Regular Army of early 1941. Medical units are a part of the tactical structure of the regiments, divisions, corps, and field armies; of the several Air Forces; of the swiftly expanding Armored Force. Station hospitals and general hospitals, depots of supply, and other installations are being provided as the needs increase. Task forces take with them as a matter of course the men and means to provide medical support wherever it may be needed. Doctors and Nurses, Dentists, Veterinarians, members of the Medical Administrative Corps, officers of the Sanitary Corps, each with their invaluable helpers—the Medical Soldiers—will undertake the inspiring and gigantic tasks which lie before them to conserve the fighting strength of the armed forces. The

professional medical men pledge themselves to the successful execution of their tasks. Anxious citizens may take hope and have confidence. The Medical Department will succeed. Our sons will have the medical service their needs may require.

THE CONGRESS AND THE ARMY

Responsibility of the Congress. Under the Constitution the Congress is given many responsibilities, including the power to "raise and support armies" for the defense of our nation and the power to declare war. Thus Congress determines the size of the Army and each of its three components and appropriates money to maintain the military establishment. The Senate and the House of Representatives each have a Committee on Military Affairs and a Committee on Appropriations. Practically all legislation affecting the Army of the United States, except appropriations, is referred by each House to its Committee on Military Affairs for study and report.

Since the Constitution requires that legislation for appropriations must originate in the House of Representatives, the work of studying the budget estimates and of preparing bills for Army appropriations is done by the War Department Subcommittee of the House Committee on Appropriations. This committee is not bound by the totals given in the President's budget, though generally it follows the budget rather closely.

The War Department and the Congress. The War Department General Staff, under the direction of the Deputy Chief of Staff, draws up instructions to guide the chiefs of the arms, services, and bureaus in preparing estimates of the cost of the activities for which they are responsible. After approval of the Secretary of War, the Budget Officer of the War Department (the Chief of Finance) submits the War Department estimates to the Bureau of the Budget. Thus, before presentation to Congress, legislation proposed by the War Department is first processed through the Bureau of the Budget to be certain it is in accord with the program of the President. Other legislation affecting the War Department, proposed by individual members of Congress, is referred to the appropriate committee, and the War Department is generally requested by the committee to submit a report upon it.

THE WAR DEPARTMENT

The War Department. The Department of War, usually designated as the War Department, was the second *executive* department to be provided by the statutes of the First Congress under the Constitution. It was created by an Act of Congress approved August 7, 1789, succeeding a similar department which was established prior to the adoption of the Constitution. Subsequent acts and executive orders have greatly altered the scope and functions of the activities of the Department since its inception, as it originally encompassed many activities later delegated to the Navy and Interior Departments.

War Department Reorganization. The President approved a reorganization of the War Department and the Army, effective March 9, 1942. The plan was adopted after long and searching study in order to provide the most effective structure for the waging of successful war. It provides, under the Secretary of War and the Chief of Staff, a War Department General Staff, a Ground Force, an Air Force, and a Services of Supply, all with headquarters in Washington, D. C., and in addition thereto such number of oversea departments, task forces, base commands, defense commands, commands in theaters of operations, and other commands as may be necessary in the national security. (Circular No. 59, March 2, 1942) Plate 1.

The functions, duties, and powers of the chiefs of the following arms are transferred to the jurisdiction of the Commanding General, Army Ground Forces: Infantry, Cavalry, Field Artillery, and Coast Artillery Corps (except those relating to procurement, storage, and issue.) The latter are transferred to the Commanding General, Services of Supply.

President is Commander in Chief. The President is the constitutional Commander in Chief of the Army. Command is exercised through the Secretary of War, who is

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charged with carrying out the policies of the President in military matters.

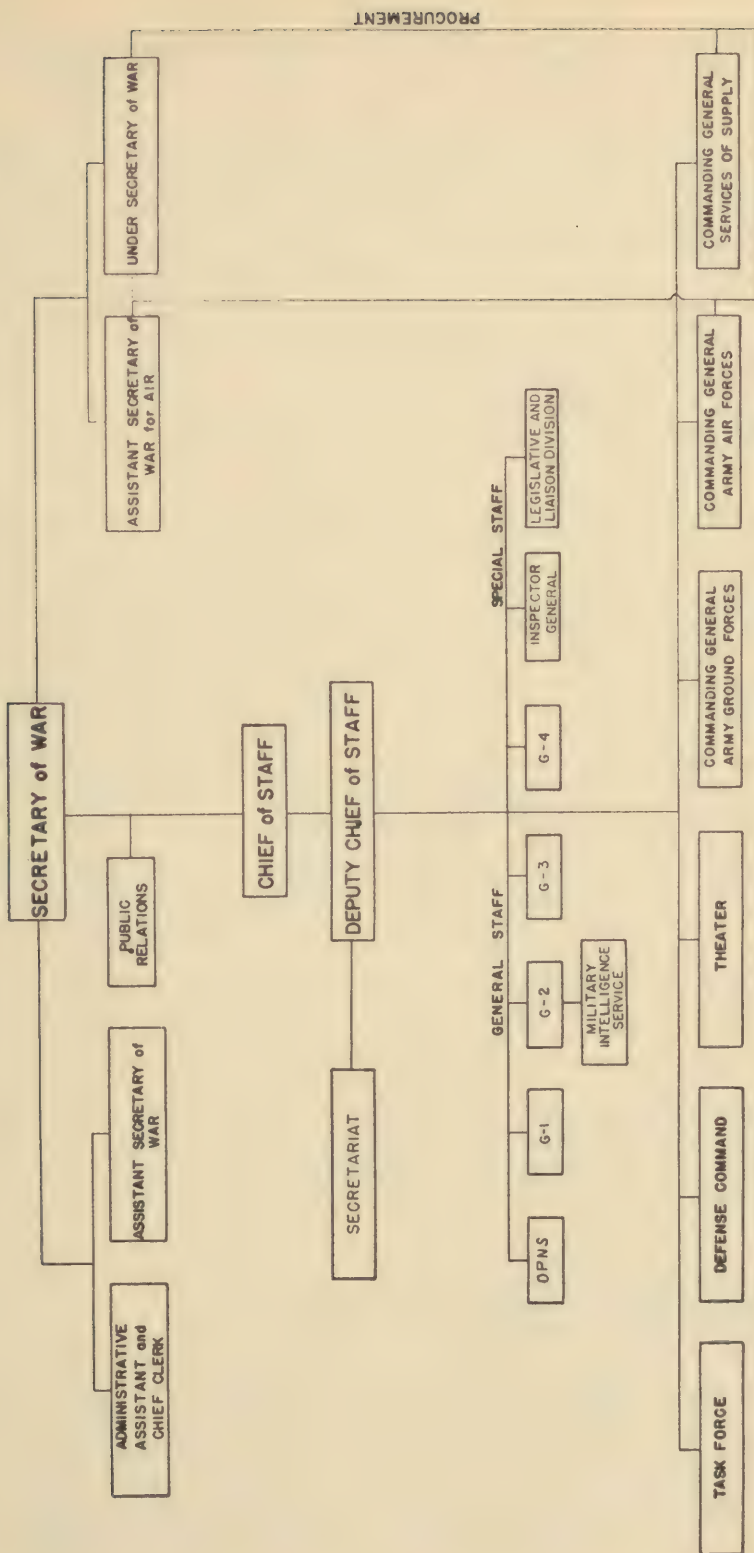


Plate 1. Organization of the Army.

The Secretary of War. The Secretary of War represents the President in exercising his command function, and under the law and decisions of the Supreme Court his acts are the President's acts and his directions and orders are the President's directions and orders.

The Secretary of War is the head of the War Department. He supervises all estimates for appropriations for Army expenses, all expenditures of money appropriated by Congress for the Army, and all expenditures for civil works placed under his direction by Congress. He carries out the provisions of the National Defense Act and is responsible for the protection of our seacoast, our harbors, and our cities; for the development of improved weapons and equipment; for the instruction, discipline, and morale of all components and military training activities of the Army. He supervises the maintenance and conduct of the United States Military Academy at West Point. There are many other duties which fall to him as directed by the Congress and the Chief Executive.

The Secretary of War is assisted by the Under Secretary of War, the Assistant Secretary of War, and the Assistant Secretary of War for Air.

The Under Secretary of War. To the Under Secretary of War is delegated all duties concerned with procurement of munitions for the Army.

The Assistant Secretary of War. To the Assistant Secretary of War is delegated general administrative duties within the War Department.

The Assistant Secretary of War for Air. To the Assistant Secretary of War for Air is delegated special duties in connection with the expansion of the Army's Air Forces.

The War Department General Staff. The Secretary of War is advised and assisted in military matters by the War Department General Staff—consisting of the Chief of Staff, a Deputy Chief of Staff, five Assistant Chiefs of Staff, a Secretary, and a number of selected officers of the Regular Army, National Guard, and Organized Reserves. Such officers are detailed from their respective arms and services to the General Staff Corps. The divisions and subdivisions of the War Department General Staff do not engage in administrative duties performed by other agencies, but confine themselves to preparing and supervising plans and policies approved by the Secretary of War.

The Chief of Staff. The Chief of Staff is the immediate adviser of the Secretary of War and assist the Commander in Chief (the President) on all matters relating to the military establishment. He heads the War Department General Staff and directs its formulation of plans for recruiting, mobilizing, equipping, and training the United States Army, and for its demobilization. As the agent of the Secretary of War, he issues orders to insure the harmonious execution of the military plans of the War Department. The Chief of Staff holds the temporary rank of General while in office. He exercises command of the Field Forces after the outbreak of war until such time as the President designates a commanding general of those Field Forces. He is the principal officer of the Army.

The Deputy Chief of Staff. A Deputy Chief of Staff assists in supervising General Staff activities and in discharging the heavy responsibilities which devolve upon the Chief of Staff. He acts for the Chief of Staff in his absence.

The Assistant Chiefs of Staff. Five Assistant Chiefs of Staff head the five divisions of the General Staff. These divisions are:

The Operations Division.

The Personnel Division, known as G-1.

The Military Intelligence Division, known as G-2.

The Organization and Training Division, known as G-3.

The Supply Division, known as G-4.

The Personnel Division. The Personnel Division prepares plans and policies and supervises activities that concern the officers and enlisted men of the Army as individuals. These activities deal with procuring, classifying, assigning, promoting, paying, transferring, retiring, and discharging, in peace and in war, all personnel of all components of the Army.

This division is also concerned with measures for conserving manpower, with replacements of personnel, Army regulations, uniform regulations, decorations, religious

and recreational work, cooperation with the Red Cross and similar organizations (except for medical care and hospitals), military government of civilians in occupied territory, evacuation of our own civilians from the theater of war, regulations concerning enemy aliens and conscientious objectors, prisoners of war, and other matters.

The Military Intelligence Division. The Military Intelligence Division collects, evaluates, and disseminates military information, including activities concerning military topographical surveys and maps, military attaches, military observers and foreign-language students, intelligence personnel of all units, foreign military attaches and missions, codes and ciphers, and translations.

Military attaches submit reports on foreign military activities to the Military Intelligence Division. These reports concern the progress of campaigns, organization and equipment of foreign armies, and related data, thus enabling the War Department and its agencies to keep abreast of latest developments. The *Army Directory*, October 20 1941, lists officers accredited as attaches to forty-two³ foreign governments, seventeen of which are nations of South and Central America. These officers are stationed at embassies or legations of the United States and function through the ambassadors or ministers.

The Organization and Training Division. The Organization and Training Division is charged with planning and supervising activities relating to the organization, training, and operation of the military forces, except for those matters expressly assigned to the Operations Division. It prepares plans and policies concerning organization, including tables of organization, educational and vocational training, training regulations, the United States Military Academy, the Command and General Staff School, the Army War College, the special and general service schools, military training in civilian institutions and in civilian training camps, movement of troops, replacement priorities, disaster relief plans, and military police.

The Supply Division. The Supply Division supplies the Army, and plans for all equipment, buildings, storage, transportation, and distribution of supplies, and for other facilities. This division is also concerned with traffic control, hospitalization and evacuation of sick and wounded men and animals, inventions, responsibility and accountability for Army property, procurement of real estate, and construction and maintenance of buildings. It maintains liaison with the various governmental agencies having defense duties—such as the Federal Works Agency, the Civilian Aeronautics Administration, etc.

Operations Division. An Operations Division was set up in the War Department General Staff, replacing the War Plans Division, shortly after the reorganization was effected.

This Division in addition to other duties coordinates strategical and operational planning with the Navy and with the military headquarters of all United Nations. It is charged with operational procedures for the strategical employment of all components of the Army of the United States. The change of name is appropriate because this Division not only plans the war but conducts the war in the sense that it directs the movements of the Air and Ground Forces which with the Services of Supply forms the new Army.

The Secretary of the General Staff. The Chief of Staff has an officer, usually a colonel, as Secretary of the General Staff, with one or more assistant secretaries, also officers. These officers present to the Chief of Staff and the Deputy the papers concerning policy and administration which come to the Chief of Staff for action or for discussion with the Secretary of War.

Statistical Branch. The Chief of Staff is also assisted by a statistical officer who maintains up-to-date, factual data concerning the Army. This branch functions under the Secretary of the General Staff.

Legislative and Liaison Division. The Legislative and Liaison Division, War Department, is charged with supervising the preparation of legislation requested by the

³ Since the outbreak of war military attaches have been withdrawn from seven of these countries.

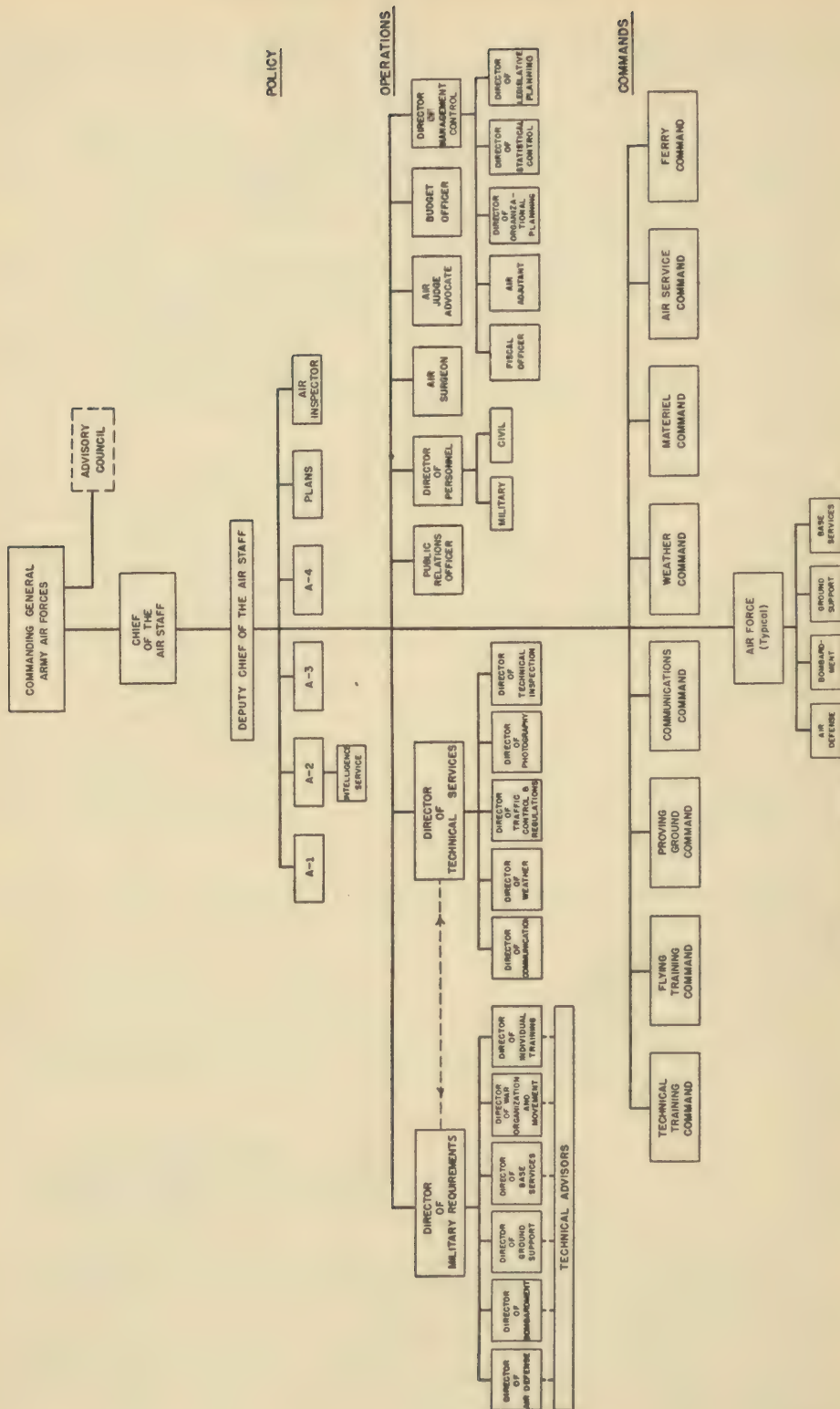


Plate 2. Organization of the Army Air Forces.

War Department, with preparing reports to Committees of Congress, and with the liaison necessary thereto. Preparation of reports on legislation affecting the Army Ground Forces, the Army Air Forces, or the Services of Supply may be assigned to the command concerned.

The Military Intelligence Service. The Military Intelligence Service, under the direction of the Assistant Chief of Staff, Military Intelligence Division, War Department General Staff, collects, compiles, and disseminates military intelligence. The activities and personnel of the Foreign Liaison Section of the Air Staff are transferred to the Military Intelligence Service.

Bureau of Public Relations. The War Department Bureau of Public Relations distributes all War Department material of general public interest.

The Inspector General's Department. The Inspector General's Department inquires into, and reports upon, all matters affecting the efficiency and economy of the Army, and makes inspections, investigations, and reports prescribed by law or directed by the Secretary of War, by the Chief of Staff, or requested by the Commanding Generals of the Army Ground Forces, of the Army Air Forces, and of the Services of Supply.

Task Forces. The direction of Task Forces is vested in the War Department. A task force is a body of troops organized to do a specific job.

THE ARMY AIR FORCES

Mission. The Army Air Forces procure and maintain equipment peculiar to the Army Air Forces, and provide air force units properly organized, trained, and equipped for combat operations. Under policies prescribed by the Chief of Staff, the Commanding General, Army Air Forces, is charged in general with the command authorized by law, Army Regulations, and custom over individuals and units assigned to the Army Air Forces.

The training mission requires the operation of replacement training centers and schools, including officer candidate schools, for the training of personnel in pilot functions and specialist nonpilot functions of combat and ground crews and in all duties involving the care, supply, and maintenance of aeronautical material.

Since the ultimate purpose of the Army Air Forces is decisive participation in combat, their basic responsibility is to organize tactical units and to develop tactical and training doctrines to guide these units. The finest aviation equipment used by these units can be obtained only by experiment and test.

There are many other duties which fall to the Army Air Forces and their commanding general. They must operate with the Army Ground Forces as a tactical team to gain ultimate victory. They must operate with the Services of Supply in all problems of procurement, shipment, distribution and construction. They must be prepared to operate in joint action with the Navy.

It is a huge task. This organizational structure is designed and intended to supply the needs.

The Air Staff. The Chief of the Air Staff is the immediate adviser of the Commanding General, Army Air Forces. He exercises control of the Air Staff and is assisted by the Deputy Chief of the Air Staff.

The Air Staff is organized on the same basis and with the same general responsibilities as the divisions of the War Department General Staff. Under the direction of the Commanding General, Army Air Forces, it coordinates and develops the Air Forces.

Plate 2 shows the organizational structure of the Army Air Forces.

THE ARMY GROUND FORCES

Mission. The mission of the Army Ground Forces is to provide ground force units properly organized, trained, and equipped for combat operations. Under policies prescribed by the Chief of Staff, the Commanding General, Army Ground Forces, is charged in general with the command authorized by law, Army Regulations and custom over individuals and units assigned to the Army Ground Forces.

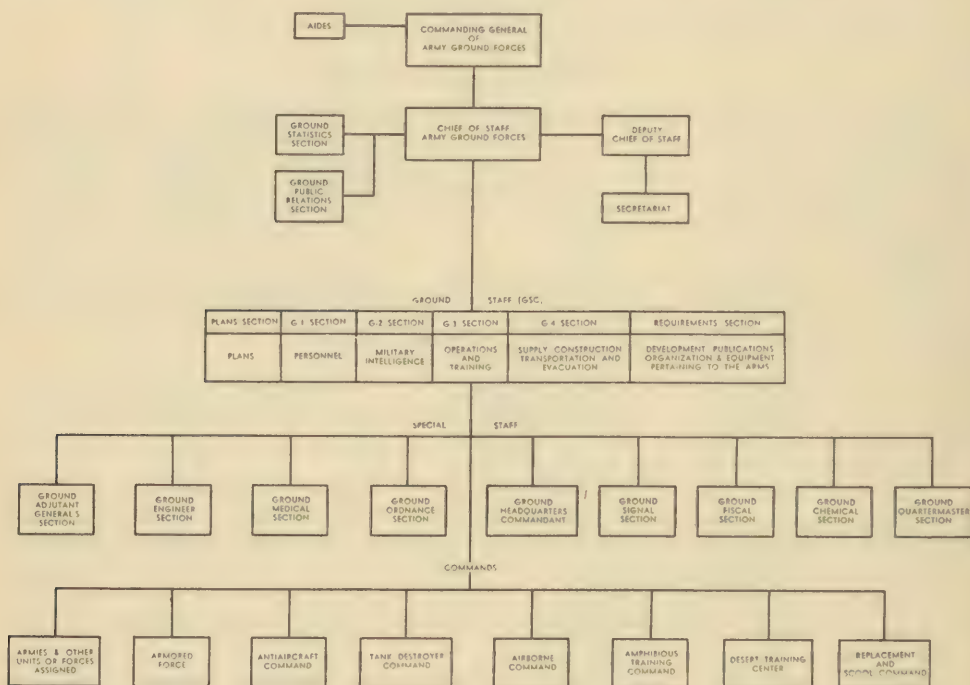
The training mission requires the operation of schools and replacement training centers, including officer candidate schools, for Infantry, Field Artillery, Coast Artillery, and Cavalry, which functions, heretofore, were performed by the chiefs of the arms named. In the execution of this function he is assisted by the Replacement and School Command.

Tactical units such as infantry divisions, armored division, cavalry divisions, and others, as well as the larger units of the combined arms are organized, developed, and trained as directed by the War Department.

Tactical and training doctrines are developed. The finest equipment is developed and tested.

The Commanding General, Army Ground Forces, is responsible jointly with the Commanding General, Army Air Forces, of ground-air support, tactical doctrine and training in conformity with policies prescribed by the Chief of Staff.

The Army Ground Forces operate with the Services of Supply in order to facilitate the procurement, shipment, and distribution of supplies and services under the control of the Commanding General, Services of Supply.



Text to letter 370 2-8 (AGF)
[6, 24-43] Headquarters Army Ground Forces
July 6, 1942 Subject: Organization of
The Army Ground Forces

Plate 3. Organization of the Army Ground Forces.

The Ground Staff. The Commanding General, Army Ground Forces, is provided with a General Staff, an Operating Staff, and a Special Staff.

The Ground Staff, or General Staff, is organized on the same basis and has the same functional responsibilities as the several divisions of the War Department General Staff.

Plate 3 shows the organizational structure of the Army Ground Forces.

THE SERVICES OF SUPPLY

Mission. The Services of Supply provide services and supplies to meet military requirements except those peculiar to the Army Air Forces. Procurement and related functions are executed under the direction of the Under Secretary of War.

The Services of Supply consolidates under the jurisdiction of the Commanding General, Services of Supply, the supply services, certain administrative services of the War Department, certain parts of the office of the Under Secretary of War, certain boards and committees, general depots, ports of embarkation and auxiliaries, and the nine service commands (formerly called corps areas.)

The duties and responsibilities of the Commanding General, Services of Supply, and the many agencies under his control, are concerned primarily with development, procurement, storage, and distribution of supplies, except those peculiar to the Army Air Forces. The duties include transportation and traffic control; construction; the administration of Army-wide functions pertaining to military and non-military personnel as individuals; the operation of replacement training centers and schools for the supply services, including officer candidate schools; the operation of all reception centers; the organization of all units assigned to the Services of Supply; and, among still other responsibilities, the command and control of all stations except those assigned the Army Air Forces, defense commands, and theaters of operation.

The Staff, Services of Supply. The staff of the Commanding General, Services of Supply, consists of a chief of staff, and the several staff divisions shown in Plate 4. This staff may be regarded as similar to the General Staff of other commanding generals and consists, in part, of officers detailed in the General Staff Corps.

The Supply Services. The several Supply Services carry out their functions as heretofore except that their missions are guided and coordinated by the Commanding General, Services of Supply. They are: The Quartermaster Corps, Corps of Engineers, Transportation Corps, including ports of embarkation, Ordnance Department, Medical Department, Signal Corps, and Chemical Warfare Service.

The Administrative Services. The several administrative services perform their functions, as heretofore, under the Chief of Administrative Services. These agencies are: Post Exchange Services, Chief of Chaplains, Chief of Finance, Judge Advocate General, Statistical Services, Adjutant General, Provost Marshal General, Chief of Special Services.

The Service Commands. The nine Service Commands (formerly corps areas) which heretofore have been responsible directly to the War Department are placed under the Commanding General, Services of Supply.

COMPONENTS OF THE ARMY OF THE UNITED STATES

The Army of the United States. The Army of the United States consists of the Regular Army, the National Guard while in the service of the United States, and the Organized Reserves, including the Officers' Reserve Corps and the Enlisted Reserve Corps. The strength of these components during the period 1920-1940 is shown in Plate 5. Units of the Army, as of December 7, 1941, are shown in Plate 6.

While the strength of the Army of the United States has continued to grow in keeping with the needs of the huge task ahead, the figures on strength of September 25, 1941, are reproduced as an interesting study. The exact current strength figures of course are unavailable for publication.

OFFICERS

Regular Army	15,000
National Guard	22,000
Reserve Officers	74,000
Total	111,000

ENLISTED MEN

Regular Army, 3 year enlistments	503,000
Regular Army Reserve and one year enlistments	17,500
National Guard in Federal Service	256,000
Selective Service Trainees	712,000
Total	1,488,500

TOTAL COMBINED STRENGTH

Regular Army	535,500
National Guard	278,000
Reserve Officers	74,000
Selective Service Trainees	712,000
Total	1,599,500

A major accomplishment has been the welding of separate prewar components into an integrated whole. Component distinctions have been largely eliminated. No single unit can be said to be composed of members of the Regular Army or of the National Guard. Individual officers and men have merged themselves into the larger and more important structure. The fact is that few know or care especially from which component an individual was drawn. This is a good and worthy accomplishment. All stand together in all ways, united in the common cause of winning a hard war.

THE REGULAR ARMY

Definition. The Regular Army is our only permanent, professional military force. It consists of officers and soldiers who have chosen as a career the lifetime study of military matters. The military instructors, strategists, technicians, and technical experts in the Regular Army form the structural foundation of an enlarged Army and constitute the backbone of the land forces required for any military effort undertaken by the United States. The historic policy of the United States has been to maintain a small standing army of trained officers and enlisted men around which an adequate military force must be constructed in a time of national peril.

Mission. The National Defense Act, as amended, stipulates the following specific missions for the Regular Army.

Garrisons for the continental frontiers of the United States and overseas possessions, small garrisons in a few of the seacoast defenses, and caretakers for the remainder.

Personnel for the development and training of the National Guard, Organized Reserves, and Reserve Officers' Training Corps, and for the conduct of Citizens' Military Training Camps.

An organization for the administration and supply of the peacetime establishments.

A framework for rapid expansion to meet wartime requirements.

A repository of cumulative military knowledge, and a laboratory for military developments so as to keep this country up to date and prepared.

In conjunction with the National Guard, a covering force in case of a major war.

The mission of the Regular Army during the period of trial following the recurrence of war in Europe and Asia has included the responsibility of training, equipping, and organizing the vast number of men who have been brought within its ranks into a formidable fighting force. Its own expansion from a strength of some 174,000 men and 14,000 officers, on July 1, 1939, to a total of 535,500 on September 25, 1941, presented special difficulties. Had the nation lacked professional soldiers the tremendous task of expanding the nation's active service strength tenfold would have verged upon the impossible. The contribution of the Regular Army in this great national effort is of vital importance to its ultimate success.

Research by the Regular Army has been conducted continually to insure the latest developments in arms, ammunition, and essential equipment. The goal has been to obtain the best airplanes, tanks, guns, ammunition, experimenting, planning, and testing.

The strength of the Regular Army through the years of peace is established by the Congress and is determined annually by appropriations. Its commissioned strength has varied from about 12,000, in 1923, to more than 14,000 in 1942. Its enlisted strength hovered at about 125,000 during the period 1923 until the remilitarization of Germany, in 1935, at which time a gradual increase was accomplished to about 250,000, in 1940, since which time the increase has been more rapid. Plate 5.

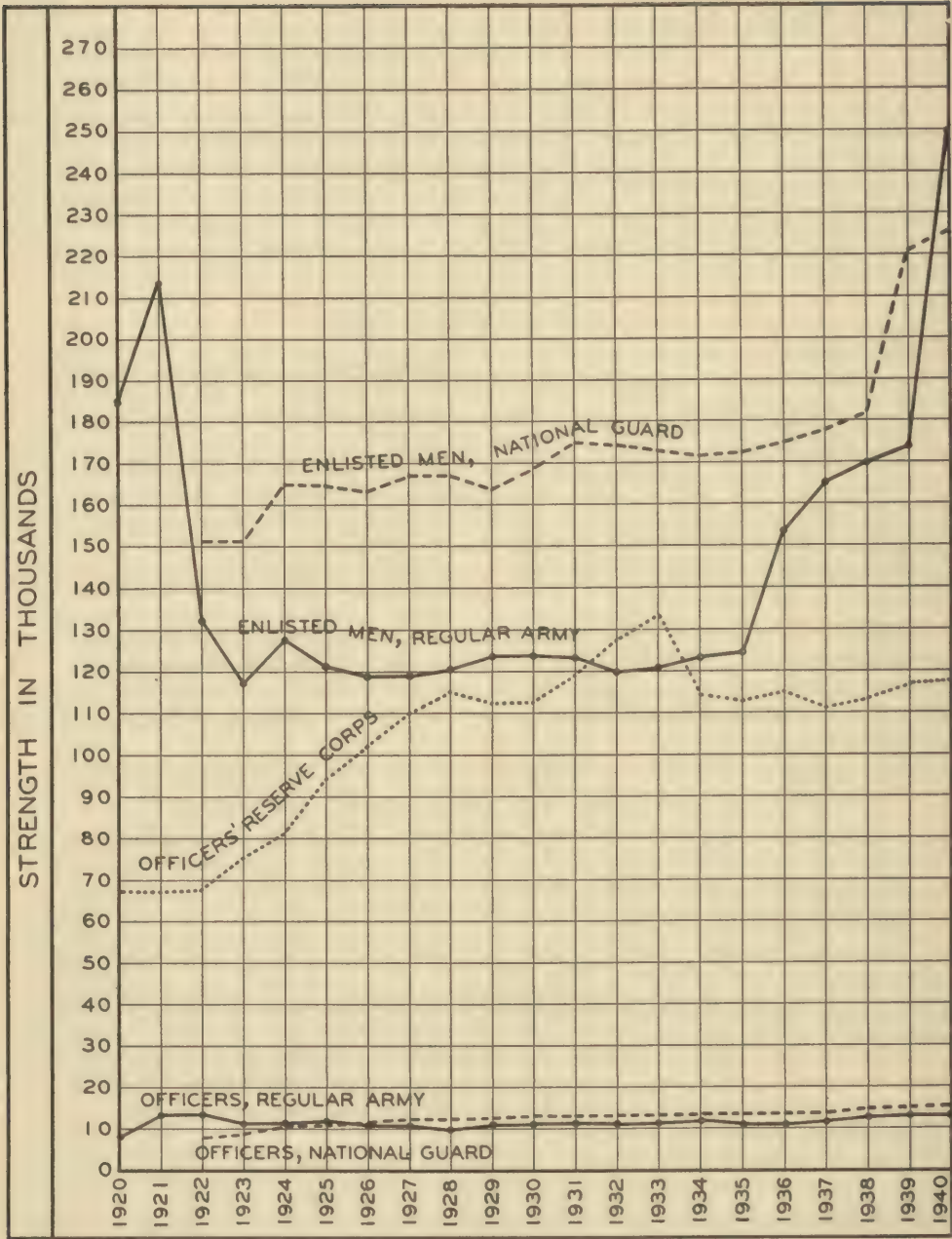


Plate 5. Strength of the Army of the United States, 1920-1940.

Units	Strength (approximate)	Rank of commander (normal)	Other names for units of similar size	Arms and services composing the unit
Squad	16 or less	Sergeant or corporal.	Found in nearly all arms and serv- ices. Composed only of troops from a single arm or service, except that chaplains and medical personnel form part of any regiment of any arm or service.
Section	2-136	Sergeant .....	.....
Platoon	4-177	Second or first lieutenant.	Called "subflights" in the Air Forces.	
Company	12-700	Captain	Called "batteries" in the Field and Coast Artillery; "troops" in the Cavalry; "flights" in the Air Forces.	
Battalion	128-1250	Lieutenant col- onel or major.	Called "squadrons" in the Cavalry and Air Corps.	Found only in the Infantry, Cavalry, Field Artillery and Coast Artillery. The triangular infantry division contains no bri- gades. Composed of regi- ments, and bat- tallions from many different arms and services.
Regiment	800-3700	Colonel	Called "groups" in the Air Forces.	
Brigade	3400-6900	Brigadier gen- eral.	Called "wings" in the Air Forces.	
Division. (There are three main types of divi- sions — infan- try, cavalry and armored.) In infantry divisions, infan- try forms the basic fighting strength, and in cavalry divi- sions the main combat arm is cavalry. There may also be special divisions as motorized, mountain, etc., organized for particular mis- sions.	Triangular in- fantry division, 15,500; cavalry divisions, 10,000.	Major general .	.....
Corps (often called "army corps" to dis- tinguish it from arms and serv- ices which have the word "corps" as part of their names, such as the corps of Engi- neers and the Coast Artillery Corps).	65,000-90,000	Lieutenant general.	Composed of infan- try divisions or of cavalry divisions, or armored divi- sions and of addi- tional brigades, regiments, and battallions, from many different
Army (often called "field army" to dis- tinguish it from the whole Army of the United States, of which such a unit forms only a part).	200,000-400,000 ..	General	Composed of corps, and of additional units from several arms and services. Contains officers of all arms and serv- ices.

Plate 6. Units of the Army as of December 7, 1941.

THE NATIONAL GUARD

Introduction. The National Guard is made up of citizens of the United States who are so interested in national defense that they take an active part in military matters outside of the time devoted to their regular professions and occupations. There are National Guard units in each of the forty-eight States, in Hawaii, Puerto Rico, Alaska, and in the District of Columbia. Like the Regular forces, the National Guard contains units of all the different arms and services that go to form the modern army.

The National Guard receives money for many of its needs by annual appropriation from Congress. These funds provide arms and other equipment, uniforms, motor vehicles, horses, and airplanes, for the construction and repair of certain buildings at camps, for sending officers to the service schools of the Regular Army for courses of training, and for many other needs. The National Guard receives money from the States for the building and upkeep of armories and camps, for extra field training pay and extra pay in times of State emergency, and for numerous other expenses.

The National Guard is organized into divisions, brigades, regiments, and other units like the Regular Army. The units in each corps area come under the supervision of the corps area commander in time of peace, and automatically become part of his command when they are first ordered into the active military service of the United States in case of national emergency.

During the World War I, National Guard units of the various States and Territories contributed nearly half a million men to the Army. Two out of every five divisions that went to France were National Guard units, and by far the greater part of these saw service on the field of battle.

Definition and Purpose. The National Guard is legally defined as the "organized militia of the several States, Territories, and the District of Columbia," but it is far from being "militia" as that term is generally understood. There are National Guard organizations in each of these political subdivisions. Service in the National Guard, for both officers and enlisted men, is wholly voluntary. While essentially State or Territorial troops, they are equipped, trained, and limited as to number by regulations promulgated by the Federal government.

The National Guard has two aspects. *First*, it comprises the organized military force of the State to which it pertains. As such, it can be utilized by the State authorities for any legitimate purpose authorized by the laws of the State. When not in the Federal service it is under the command of the Governors of the various States. *Second*, when authorized by Congress, the President may call or draft any or all units, and the members thereof, into the active service of the United States. Its personnel and units thus constitute a reserve component of the Army of the United States. When serving in this capacity members of the National Guard become Federal troops subject only to the orders of the Federal government.

In time of peace, the mission of the National Guard is to provide an adequate, organized and effective force, sufficiently trained and developed so that it will be available in minor emergencies for employment *within the limits of the United States by the States or by the United States*, and so that it will be immediately available for employment in the execution of limited missions.

In time of war or major emergencies, when Congress has authorized the use of troops in excess of those of the Regular Army, the mission of the National Guard is to provide an adequate and effective component of the Army of the United States *for employment by the United States without restrictions as to missions or place of employment*.

Composition of the National Guard and the National Guard of the United States. The National Guard of each State, Territory, and the District of Columbia shall consist of members of the militia voluntarily enlisted therein, who upon original enlistment shall

(*Sec. 58, N.D.A., as amended*)

be not less than 18 nor more than 45 years of age, or who in subsequent enlistment shall be not more than 64 years of age, organized, armed, equipped, and federally recognized as hereinafter provided, and of commissioned officers and warrant officers who are citizens

of the United States between the ages of 21 and 64 years: *Provided*, that former members of the Regular Army, Navy, or Marine Corps under 64 years of age may enlist in said National Guard.

The National Guard of the United States is a reserve component of the Army of the United States consisting of federally recognized National Guard units, and organizations, and of the officers, warrant officers, and enlisted members of the National Guard of the several States, Territories, and the District of Columbia, who shall have been enlisted and appointed, or enlisted, as the case may be, in the National Guard of the United States, and of such other officers and warrant officers as may be appointed therein. That the members of the National Guard of the United States shall not be in the active service of the United States except when ordered thereto in accordance with law, and, in time of peace, they shall be administered, armed, uniformed, equipped, and trained in their status as the National Guard of the several States, Territories, and the District of Columbia as provided in this act: *And provided further*, that under such regulations as the Secretary of War shall prescribe, noncommissioned officers, first-class privates, and enlisted specialists of the National Guard may be appointed in corresponding grades, ratings, and branches of the National Guard of the United States, without vacating their respective grades and ratings in the National Guard.

"Militia" Defined. The *militia* of the United States consists of all male citizens of the United States and all other able-bodied males who have or shall have declared their intention to become citizens of the United States, who are more than 18 years of age and not more than 45 years of age, and said militia shall be divided into three classes, the National Guard, the Naval Militia, and the Unorganized Militia. (Sec. 57, National Defense Act.) There are important exemptions from militia duty which are listed in Section 59, National Defense Act.

Strength and Organization. The National Guard, by the executive order of September 8, 1939, was increased to an authorized strength of approximately 15,000 officers and 235,000 enlisted men.

NATIONAL GUARD INFANTRY DIVISIONS

<i>Service Commands</i>	<i>Division</i>	<i>States</i>
I.....	26th Division...	Massachusetts.
I.....	43d Division...	Connecticut, Maine, Rhode Island, Vermont.
II.....	27th Division...	New York.
II.....	44th Division...	New Jersey, New York.
III.....	28th Division...	Pennsylvania.
III.....	29th Division...	Maryland, Virginia, District of Columbia, Pennsylvania.
IV.....	30th Division...	Georgia, North Carolina, South Carolina, Tennessee.
IV.....	31st Division...	Alabama, Florida, Louisiana, Mississippi.
V.....	37th Division...	Ohio.
V.....	38th Division...	Indiana, Kentucky, West Virginia.
VI.....	32d Division...	Michigan, Wisconsin.
VI.....	33d Division...	Illinois.
VII.....	34th Division...	Iowa, Minnesota, North Dakota, South Dakota.
VII.....	35th Division...	Kansas, Missouri, Nebraska.
VIII.....	36th Division...	Texas.
VIII.....	45th Division...	Arizona, Colorado, New Mexico, Oklahoma.
IX.....	40th Division...	California, Nevada, Utah.
IX.....	41st Division...	Idaho, Montana, Oregon, Washington, Wyoming.

There are National Guard units in each of the forty-eight States, in Hawaii, Puerto Rico, and Alaska. These units are distributed in 1500 different stations. Like the Regular Army, the National Guard contains units of all the different arms and services that go to form a modern army.

Units of the National Guard, like those of the Regular Army and the Organized

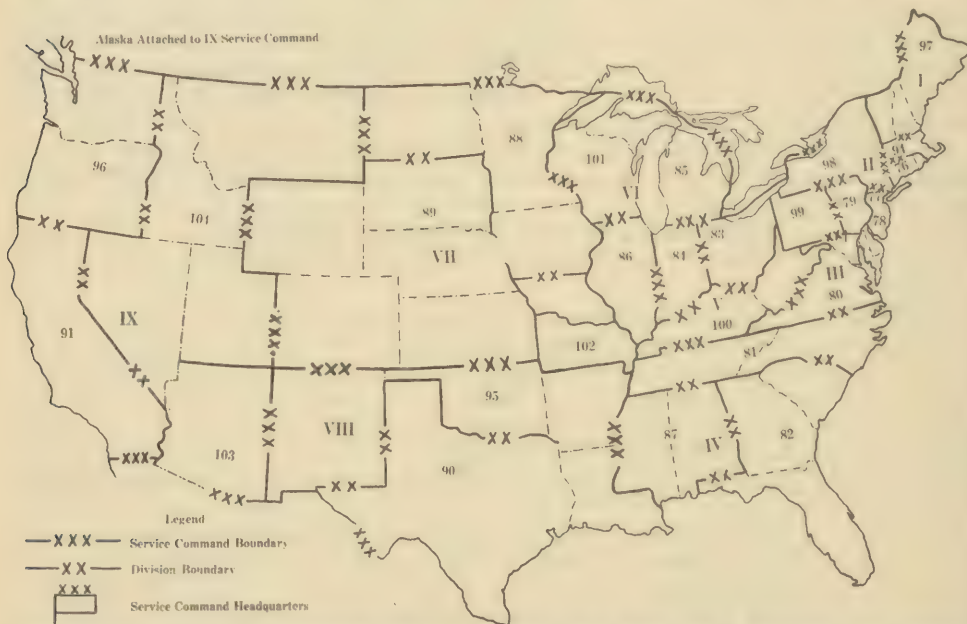
Reserves, are designated by numbers. Regiments have, in general, numbers between 100 and 300, and infantry divisions have numbers between 26 and 75.

The National Guard Bureau. The National Guard Bureau in Washington is the central agency which supervises the work of the National Guard. The Chief of the National Guard Bureau is an officer of the National Guard appointed by the President to active duty for four years with the rank of major general.

THE ORGANIZED RESERVES

Organization and Purpose. The Organized Reserves consist of the Officers' Reserve Corps, the Enlisted Reserve Corps, and the Organized Reserve units. It constitutes one of the components of the Army of the United States, the other two being the Regular Army and the National Guard.

The Officers' Reserve Corps, consisting of approximately 118,000 officers at the close of fiscal year 1940, is composed of men who have voluntarily accepted commissions therein, from second lieutenant to brigadier general. Serving generally on an inactive status without pay, they are occasionally ordered to short periods of active duty; during the fiscal year ending June 30, 1938, for example, a total of 27,685 received this training. The older officers are those who served, mostly as officers, during the World War. The younger officers have been commissioned since World War I, usually after graduation from the Reserve Officers' Training Corps.



The Service Command Headquarters are: I, Boston; II, New York; III, Baltimore; IV, Atlanta; V, Columbus; VI, Chicago; VII, Omaha; VIII, Dallas; IX, Douglas; Northwest Service Command, Whitehorse, Yukon Territory, Canada.

Plate 7. Organized Reserves—Division Areas.

The Enlisted Reserve Corps is composed of persons voluntarily enlisted for service in the corps.

The Organized Reserve units are composed of officers of the Officers' Reserve Corps and of enlisted men of the Enlisted Reserve Corps. Through the years, many such units have been officered at war strength, prepared for mobilization, the reception of enlisted personnel, and further trained to perform their functions in the event of war. Units allotted to each Service Command usually include three infantry divisions and a proportion of corps, army, auxiliary, and special troops. Within Service Commands, units are allocated to states by Service Command commanders, under general instructions issued by the War Department. War strength tables of organization form the basis of organization. Plate 7 shows the allocation of Organized Reserve divisions.

The Organized Reserves, which form the smallest component of our peace time army, and consists mostly of officers, undergo by far the largest expansion in time of war, and supply initially about the same number of organizations as the Regular Army and National Guard combined.

The Officers' Reserve Corps is a means whereby officers are provided:

For the Organized Reserves at all times.

For the Regular Army and National Guard for expansion on mobilization.

For other specific duties pertaining to mobilization and subsequent operations of the Army.

Sections of the Officers' Reserve Corps. The authorized sections of the Officers' Reserve Corps correspond with the arms and services of the Regular Army. But in addition to these, several other sections have been established in the Officers' Reserve Corps by the President's direction in which officers procured for special purpose are commissioned. The existing sections, with their proper abbreviated designations, are listed below:

Adjutant General's Department Reserve, AG-Res.

Air Corps Reserve, Air-Res.

Cavalry Reserve, Cav-Res.

Chaplain's Reserve, Ch-Res.

Chemical Warfare Service Reserves, CW-Res.

Coast Artillery Corps Reserve, CA-Res.

Corps of Engineers Reserve, Engr-Res.

Field Artillery Reserve, FA-Res.

Finance Department Reserve, Fin-Res.

Infantry Reserve, Inf-Res.

Judge Advocate General's Department Reserve, JAG-Res.

Medical Department Reserve.

Dental Corps Reserve, Dent-Res.

Medical Administrative Corps Reserve, MA-Res.

Medical Corps Reserve, Med-Res.

* Sanitary Corps Reserve, Sn-Res.

Veterinary Corps Reserve, Vet-Res.

* Military Intelligence Reserve, MI-Res.

* Military Police Corps Reserve, MP-Res.

Ordnance Department Reserve, Ord-Res.

Quartermaster Corps Reserve, QM-Res.

Signal Corps Reserve, Sig-Res.

* Specialist Reserve, Spec-Res.

* Inactive Reserve, Inact-Res.

(PAR 6, AR 140-5)

Active Duty in an Emergency. In time of a national emergency expressly declared by Congress, the President may order Reserve officers to active duty for indefinite periods without their consent. Reserve officers called to active duty for service in time of a national emergency expressly declared by Congress will, upon written application, be relieved from active duty within six months after the termination of the emergency (Par. 53, AR 140-5).

Appointment of Officers. In time of peace a Reserve officer must at the time of appointment be a citizen of the United States or a citizen of the Philippine Islands in the military service of the United States, between the ages of 21 and 60 years. Initial appointments in the lowest grades of the Officers' Reserve Corps are restricted to applicants who on date of appointment do not exceed the following ages:

(1) *Thirty years.* For the Infantry, Cavalry, Field Artillery, Coast Artillery Corps, Air Corps, Corps of Engineers, and Signal Corps.

(2) *Thirty-five years.* For the Adjutant General's Department, Quartermaster Corps, Finance Department, Medical Department (including Dental, Medical Administrative,

* Sections which are not provided in the Regular Army.

Sanitary, and Veterinary Corps), Ordnance Department, Chemical Warfare Service, Chaplains, Military Intelligence Reserve, and Specialist Reserve.

(3) *Forty-two years.* For the Judge Advocate General's Department Reserve.

In applying these age limitations, persons who have attained their thirtieth, thirty-fifth, or forty-second birthdays, respectively, will be considered as ineligible for appointment.

The length of appointment in every case is for a period of five years, but an appointment in force at the outbreak of war or made in time of war will continue in force until six months after the termination of the war, should the 5-year period covered by the appointment terminate prior to that time.

Reappointment of Officers. In time of peace when the 5-year period of appointment (*PAR 26, AR 140-5*)

of a Reserve officer expires, he may be reappointed in his former grade and section with eligibility for promotion, assignment, and active-duty training in peace time, provided he passes a satisfactory physical examination and it has been officially recorded that during his current appointment he has established his eligibility as provided below:

He has obtained a certificate of capacity for promotion to the next higher grade; or

He has obtained a certificate of capacity for his present grade; or

He has demonstrated his interest in military affairs by having a written record of at least 200 hours of credits, of which at least 100 hours have been earned on an inactive-duty status. Inactive-duty credits are earned by Army extension course work, attendance at classes, administrative duties in connection with his unit, or active participation with troops on inactive-duty training. Credit for 100 hours is given for each 14-day period of active duty provided only that an efficiency rating of "Satisfactory" is attained under the entry "Manner of performance."

He has satisfactorily completed the prescribed course of instruction for Reserve officers at the special service schools of his arm or service or the special course for Reserve officers at the Command and General Staff School, or at the Army War College.

In case eligibility has not been thus established, he may be reappointed for one 5-year period only, to the same grade and section without eligibility for promotion, assignment, and active duty training in peace time.

Promotion. Members of the Officers' Reserve Corps may obtain promotion successively, through all grades of the Army, including the grade of major general. In general, the qualifications to be demonstrated include professional fitness, the existence of an appropriate vacancy in the higher grade, minimum service in each grade prior to promotion as shown hereafter, and the completion of at least 14 days of active training with an efficiency rating of at least "Satisfactory." He must again pass the required physical examination. The appointment of general officers is subject to confirmation by the Senate. The wartime system of promotion is applicable to Reserve officers as to all others.

The required minimum service in each grade in time of peace is as follows:

	Years
As a second lieutenant	3
As a first lieutenant	4
As a captain	5
As a major	6
As a lieutenant colonel	7

Professional fitness is demonstrated, in part, by earning a "certificate of capacity" for promotion to the next higher grade. This is defined as an instrument, issued by the corps area commander of the officer concerned, that the officer named therein has met the professional qualifications prescribed for the grade and section specified in the certificate. A certificate of capacity is obtained by an applicant after the successful completion of two essential requirements: (1) A written military knowledge examination designed to test the applicant's military knowledge qualifications; (2) A practical test designed to test the applicant's ability qualifications. The former is conducted by an individual examiner appointed by the corps area commander; the latter is conducted by a board of officers appointed for that purpose.

The subjects in which military knowledge and practical ability must be proven are prescribed, for each branch and grade, in separate Army Regulations of the 140 series.

Waivers and exemptions may be secured for promotion through the following methods:

- (1) By satisfactory completion of appropriate courses of instruction for National Guard and Reserve officers at general and special service schools.
- (2) By completing appropriate subcourses of the Army extension courses.
- (3) By submitting evidence of graduation, for promotion to grade of 1st lieutenant only, from the United States Military or Naval Academies, Air Corps Training Center, or senior units of the ROTC. Graduation must have been within five years of application for certificate of capacity or promotion. Waiver is restricted to subjects in which instruction was received at the institutions listed.
- (4) The efficiency ratings awarded for periods of active service may be accepted in lieu of the practical tests. Ratings of not less than "Satisfactory" are required.

Active Duty. In time of a national emergency expressly declared by Congress, the (PAR 53, AR 140-5)

President may order Reserve officers to active duty for indefinite periods without their consent. By June 30, 1942, nearly all of the more than one hundred thousand Reserve officers who were physically qualified and troop age were on active duty.

In time of peace Reserve officers may not be ordered to active duty without their consent.

For training purposes, Reserve officers are ordered to active duty for periods of 14 days in numbers determined by the amount of the annual appropriation for that purpose. This training is restricted to those who qualify themselves by pursuing appropriate extension courses or taking other inactive duty training.

In addition to active duty for 14-day periods, active duty is available for Reserve officers for the following purposes:

- (1) As additional members of the War Department General Staff.
- (2) As student officers at special courses conducted for or available to Reserve officers at the special service schools, the Command and General Staff School, and the Army War College.
- (3) For duty with tactical units of the Air Corps.
- (4) For duty as instructors for periods of not more than 30 days at Citizens' Military Training Camps.
- (5) For extended active duty of 1 year with the Regular Army.

Training. The ultimate object in training units of the Organized Reserves in time of peace is to provide partially organized and partially trained units which may be readily expanded to war strength and completely trained in time of emergency and which, in combination with the Regular Army and the National Guard, will provide an adequate, balanced, and effective force sufficient to meet any national emergency declared by Congress. The primary purpose is efficient mobilization. The objects in training the individual Reserve officer in time of peace are: (1) To prepare him to perform efficiently the duties of his mobilization assignment; (2) To prepare him for promotion to the next higher grade.

The facilities for training while on an *inactive status* are as follows:

(1) Courses of instruction at troop schools and group schools. These schools are established at home stations of units of the Organized Reserves. Subjects of instruction include applicatory exercises employing map problems, map maneuvers, and tactical exercises; in addition, the instruction may include conferences for discussion of assigned subjects or mobilization plans.

(2) Army Extension Courses.

(3) Special assemblies of officers for individual training in the tactics and technique of their arm or service

(4) Duty on various boards of officers, on inactive status.

(5) Attachment to units of the Regular Army or National Guard.

(6) Duty on an inactive status at special and general service schools.

(7) Firing practice on inactive status.

(8) Use of Army aircraft.

The facilities for training while on *active status* include the following:

- (1) Utilization of the 14-day training period.
- (2) Duty at special assemblies for individual training in the technique or tactics of an arm or service.
- (3) Active duty with the Regular Army or the National Guard.
- (4) Duty on active status on various boards of officers.
- (5) Active duty as instructor at Citizens' Military Training Camps.
- (6) Specified courses at the various special service schools and the Command and General Staff School.
- (7) Selected courses at the Army War College.

Uniform Regulations. A Reserve officer on active duty is required to wear the uniform, including insignia, prescribed for officers of the Regular Army. Blue uniforms, however, are not required to be worn by Reserve officers although they are authorized to be worn. Reserve officers who are not on active duty and when within the United States or its possessions may wear the uniform on occasions of military ceremony, at social functions of a military character, at informal gatherings of the same character, when engaged in the instruction of a cadet corps or similar organization, or when responsible for military education at an educational institution.

Under the conditions of war service the uniform requirements are applicable equally to officers on active duty of all components.¹

THE RESERVE OFFICERS' TRAINING CORPS

Objects of the Reserve Officers' Training Corps (ROTC). The general object of the (PAR 2, AR 145-10)

courses of instruction of the ROTC is to qualify students for positions of leadership in time of national emergency. Primarily, it is an agency for the production of Reserve officers for those arms which are restricted as to their sources of production, and it should produce for those arms the number of Reserve officers required in the initial periods of a general mobilization.

There is a very important by-product which accrues to the benefit of the nation from our system of military training in schools and colleges. Those of our citizens who know from study or experience the futility of national weakness are not readily swayed by the specious arguments of the few among our people who seek to weaken or destroy our system of national defense. The presence in all professional groups of an increasing per cent of leaders who have enjoyed the benefits of military instruction serves as a stabilizing influence over the whole nation which supports and champions a sympathetic understanding of the needs of the military establishment and its purposes.

Students who complete the course, according to their own abundant testimony, secure personal benefits which are valuable to them in their occupations. They are better citizens because they have had inculcated an understanding of the responsibilities of citizenship. They realize more fully that the benefits their own generation enjoys were secured by the sacrifices made by their predecessors. They learn the necessity for discipline, the responsibility of an individual to the group as a whole, and the methods by which discipline is developed and enforced. Finally, they learn the principles of leadership and have an opportunity to exercise this art to a greater extent than that which is available to them in any other phase of their instruction.

Thus our system of military education in schools and colleges provides valuable benefits to the nation, to the Army of the United States, and to the individuals who participate in its activities. In a democracy this is the better way.

Authorization of the Reserve Officers' Training Corps. The Act of Congress approved June 3, 1916, as amended by the Act of June 4, 1920, established for the United States the system of military education in schools and colleges as we have it today. By these provisions the Reserve Officers' Training Corps has become an important part of the well-

¹ The Officer's Guide, Military Service Publishing Company, contains complete and authoritative information concerning the uniform.

integrated system of national defense upon which the nation now relies. The essential soundness of the basic Acts is well attested by consideration of the amending legislation through the years which has been concerned largely with matters of improvement or clarification. Based upon a concept which adheres strictly to American principles and ideals, the policy of military training in educational institutions has proven itself by its economy, its efficiency, and the excellence of the very large number of Reserve officers who have been commissioned into the Army of the United States.

Extent of Military Education. During the academic year 1940-41, the *Army List and Directory* records 310 educational institutions which maintain one or more units of the ROTC. The following chart lists the annual enrollment since 1919-20.

Medical units of the ROTC were in operation during the academic year 1941-42 at the following institutions:

- Boston University, Boston, Mass.
- University of Vermont, Burlington.
- Cornell University Medical College, New York City.
- Syracuse University, Syracuse, New York.
- University of Buffalo, Buffalo, New York.
- Georgetown University, Washington, D. C.
- George Washington University, Washington, D. C.
- Jefferson Medical College, Philadelphia, Penna.
- University of Pennsylvania, Philadelphia.
- University of Pittsburgh, Pittsburgh, Penna.
- Medical College of Virginia, Richmond.
- Vanderbilt University School of Medicine, Nashville, Tenn.
- Indiana University, Bloomington.
- Ohio State University, Columbus.
- Western Reserve University, Cleveland, Ohio.
- University of Michigan, Ann Arbor.
- The State University of Iowa, Iowa City.
- University of Minnesota, Minneapolis.
- St. Louis University School of Medicine, St. Louis, Mo.
- Washington University, St. Louis, Mo.
- Baylor University, College of Medicine, Dallas, Texas.
- University of California Medical School, San Francisco.
- University of Oregon Medical School, Portland.

Supervision by the War Department. The War Department is the agency of the Federal Government charged by law with the preparation of regulations and instructions carrying into effect the provisions of the national defense act and other federal statutes relating to the ROTC, and is likewise charged with the supervision of the execution of the provisions of pertinent law and regulations. In general, the supervisory powers of the War Department are delegated to the corps area commanders who act as the immediate representatives of the War Department in all relations with the educational institutions, and they are responsible that the requirements of law and regulations relating to this subject are effectively carried out.

Control at Institutions. The control of the operation of ROTC units at institutions is vested in the institutional authorities. Civilian heads of institutions exercise the same general control over the department of military science and tactics that they ordinarily exercise over their other departments.

This provision of the regulations, while not difficult of execution and compliance, includes a dual responsibility for the officers on ROTC duty. In their strictly military capacity these officers are subordinates of the corps area commander and are subject to his orders. In their academic capacity they are subject to institutional regulations. Direct correspondence between superior military authorities and professors of military science and tactics is limited to subjects of a purely military nature.

Eligibility for Enrollment. Eligibility to membership in the ROTC is limited to students at institutions in which units of the corps may be established, who are citizens of the

United States, who are not less than 14 years of age, and whose bodily condition is such as to meet the prescribed physical standard.

In general, a student is ineligible for enrollment who is a member of any component of the Army of the United States, the Navy, or of the Marine Corps.

Basic and Advanced Courses. The four years' ROTC course of the senior division is divided into the *basic course* and the *advanced course*. The basic course consists of the first two years in the department of military science and tactics which correspond to the Freshman and Sophomore years in the academic departments. The advanced course consists of the last two years in the department which correspond to the Junior and Senior years.

Students electing the ROTC training courses do so for only two years at a time. The first election is for the two years' basic course, and completion of the basic course is a prerequisite for advancement. Upon the completion of the basic course, if a student be recommended for further training, he may elect the advanced course. Once the student has signed an agreement to take the advanced course it becomes a requirement for academic graduation by virtue of the fact that the institution has agreed to make it a required subject of the institutional course. Entrance into the advanced course is both voluntary and selective in that it is entirely optional with the student as to his application, and entirely optional with the professor of military science and tactics whether he shall be accepted. Attendance at one summer camp of six weeks' duration is a requirement of the advanced course.

Hours of Instruction. The minimum number of hours of instruction required to be given in the basic course is an average of 3 hours per week, and in the advanced course, 5 hours per week. An exception is made for medical units in which 90 hours per annum is required in both the basic and advanced courses.

Year	Jr. Div ¹	Senior Div ²	Graduates	Graduates Appointed To ORC
1919-20	45,139	43,605	(No record)	135
1920-21	56,538	44,253	1272	934
1921-22	37,225	51,742	2774	2465
1922-23	37,346	57,505	4143	3786
1923-24	40,324	63,570	4370	4048
1924-25	42,190	69,368	5069	4884
1925-26	38,225	68,553	5919	5728
1926-27	38,148	70,809	5956	5836
1927-28	39,978	72,371	6127	6013
1928-29	40,521	71,903	6293	6049
1929-30	41,334	73,030	5969	5684
1930-31	41,637	75,786	6062	5602
1931-32	40,556	73,989	6447	5418
1932-33	39,466	66,729	6663	6497
1933-34	88,728	65,419	6495	6490
1934-35	41,053	76,260	6390	6350
1935-36	53,202	92,688	5663	5619
1936-37	57,777	101,728	5960	5848
1937-38	61,791	106,041	6425	6337
1938-39	65,282	111,614	6565	6700
1939-40	68,895	117,855	7992	6444
1940-41	72,151	125,647	*8627	*8000

¹ In secondary schools.

² In colleges, universities and essentially military schools.

* Approximate number.

Summer Camps Suspended. Reserve Officer Training Corps summer camps for college students who have completed a year of the advanced course have been discontinued for the duration of the war and for six months thereafter.

Duties of the Head of the Military Department. When one or more officers are detailed to an educational institution for duty with the ROTC, the senior line officer will be the professor of military science and tactics and will be the head of the department. Where officers of the services only are detailed to an educational institution the senior officer thereof will assume these responsibilities.

It is considered essential to the effective performance of his duties that the professor of military science and tactics have the academic rank which the institution accords the heads of its other departments, that he be a member of the faculty and, as such, entitled to all the rights and privileges of a faculty member with responsibilities and obligations similar to those of the heads of other departments.

The professor of military science and tactics (PMS&T) coordinates the instruction of the several units in the department. All reports, records, and other administrative requirements are performed under his supervision.

It is also considered essential by the War Department that the PMS&T be empowered to draft the rules, and orders relating to the organization, control, and training of the members of the ROTC and the appointment, promotion, and reduction of cadet officers, at civil colleges and schools (Class CC and CS), subject to coordination with general institutional regulations and arrangements and the approval of the head of the institution. At military colleges and essentially military schools (Class MC, MI, and MS) where the PMS&T is not charged with the discipline of cadets, this power except in respect to training, may properly be exercised jointly by the PMS&T and the commandant of cadets under the supervision of the head of the institution.

Restrictions Applied to Officers Assigned to ROTC Duty. Officers are required to live at or near the institution to which assigned.

They are required to appear in the proper uniform when in the performance of their military duties (including classroom instruction as well as the practical exercises).

Officers are prohibited from conducting any course of instruction in the institution other than those prescribed by the War Department.

Officers may not pursue any course of instruction conducted by the institution until after the completion of two years of their details and then only subject to approval by the War Department in each individual case. An exception to this general ruling is that corps area commander may authorize an officer to pursue pedagogical and allied psychological courses for the purpose of familiarizing themselves with the instructional policies in respect to methods of instruction and improving instructional methods in the ROTC.

Appointment of Graduates as Reserve Officers. Graduates of ROTC courses who fulfill the requirements in all ways may be commissioned into the Army of the United States as Reserve officers. Appointments are made only in the lowest authorized grade of the proper section.

The annual increment of young Reserve officers into the Officers Reserve Corps is a very important addition to the national defense. As the years pass, there is an ever-decreasing number of officers with World War experience, and the per cent of officers trained for the Reserve in the ROTC increases accordingly. The Army and the Nation have come to rely on the system of military education in colleges and universities for the supply of trained officers to be available in a time of national emergency. It is a national asset of proven value.

Under prescribed conditions students enrolled in certain medical schools may be appointed second lieutenants, Medical Administrative Corps and complete their medical training prior to being called to active duty as officers of the medical corps.

CHAPTER II

TACTICAL FUNCTIONS OF THE ARMS

INTRODUCTION

The student of the tactical employment of large military forces must acquire a clear understanding of the function of each of the several components. Only in this manner may he envision the complete function of his own arm or service in all of the conditions imposed by combat. An army is a carefully integrated organization of all required functions, the needs for which can be foreseen and provided for in advance. No one of these functional components wins battles alone. The combined, joint action of all is essential for success. For these reasons large military forces, such as the division, corps, and field army, consist of "arms," the units which engage directly in combat, and "services" which provide the required administration, supply, evacuation, and hospitalization. Each of these components is given the necessary personnel to execute its mission. This personnel is organized into units for control and efficient operation. Each component is provided with essential equipment including transportation which it will require. Doctrines and principles announced by the War Department are then applied. In battle, the commander assigns a mission or objective for the whole force and a specific task to each of its several components to achieve its accomplishment. He then coordinates and directs the action of all to achieve the ends sought. The student must learn *what* each arm and service is required to do, and then he may proceed to acquire an understanding of *when, where, and how* it is to do it.

It is particularly desirable that the officer of each of the several corps of the Medical Department possess this broad understanding. He serves and works with each arm and service. In garrison, camp, or bivouac, on the march, in battle and campaign, in success or failure, he accompanies the fighting force with his medical unit to provide, wherever his humanitarian services may be needed, medical attendance for the sick, the injured, or wounded, as well as facilities for evacuation and hospitalization. There is no single factor so destructive of the morale of fighting men as the suspicion or knowledge that the sick or wounded are being inadequately attended. In our army, medical units are an integral part of the tactical structure. The plan for any projected military operation must include a medical plan. Its preparation will fall to the medical officer. It is a doctrine that the medical plan must provide adequate support for the tactical plan, however difficult this task may be. In the execution of this mission he will make judicious use of the means in medical personnel, equipment, and transportation which are available to him. He will allot these means to units in accordance with their needs, place them where they can perform their tasks with greatest effectiveness, and move them as the supported units move, in order that continuous medical service may be provided. These are the tasks which pertain to the medical officer. If he is to perform them to the standard he will wish to attain he must possess a considerable knowledge of the functions, battle tasks, and methods of operation of each component of an army. The record achieved by members of the Medical Department in Hawaii, on Bataan and Corregidor, and elsewhere, indicates events for which the medical officer must prepare.

In addition to a discussion of each of the arms with their tactical employment, this chapter contains the elements of *camouflage* and *scouting and patrolling*. Useful information on communications applicable to all arms and services is included in the discussion of the Signal Corps.

The components of the Army of the United States (Regular Army, National Guard, Organized Reserves) pertain to two functional subdivisions, the *arms* and the *services*.

The arms engage directly in combat and are known collectively as the line of the Army. The arms are: The *Air Forces*, *Cavalry*, *Coast Artillery Corps*, *Corps of Engineers*, *Field Artillery*, *Infantry*, and *Signal Corps*. While not so classified, the *Armored Force* has many characteristics of the separate arms and may be so regarded.

The services are supply and administrative agencies designed to maintain the efficiency and morale of the combat force. The services are: *Adjutant General's Department, Chaplains, Chemical Warfare Service, Finance Department, Inspector General's Department, Judge Advocate General's Department, Medical Department, Ordnance Department, Quartermaster Corps, and the Transportation Corps.*

Of the arms, the Air Forces, Coast Artillery Corps, Corps of Engineers, and Signal Corps have service functions which are concerned, chiefly, with procurement and distribution of supplies peculiar to the arm. The Chemical Warfare Service has combat units.

INFANTRY

Mission. Infantry is the arm of close combat. In the attack it advances upon the enemy, then closes with him to effect his destruction or capture. In the defense, infantry holds the positions to which it is assigned, checks the advance of the enemy, and throws him back by counterattack. As the arm which is charged with the principal mission in battle, the mission of the infantry becomes the mission of the entire command. The other arms and the services which are present have as their battle functions the duty of assisting the infantry, enabling it to achieve a victory which, unaided, would be beyond its powers, or to enable it to gain its objectives with fewer casualties or in a shorter time.



Plate 1. Private John Doe, Infantry.

Infantry carries out its mission by fire action, movement, and shock action. The fire of infantry weapons is to inflict losses on the enemy, reduce the accuracy and volume of his fire and, in its ultimate application, to cause the enemy to abandon all else save self-preservation. Movement enables infantry units to close upon the enemy, to occupy positions more favorable for the accurate delivery of fire, or to penetrate between or around areas held by an enemy. Fire power is constantly combined with movement in such a manner that the one facilitates the progress of the other. Finally, shock action is the

culmination of fire and movement in which the destruction or capture of the enemy is effected by hand-to-hand combat.

There are many kinds of infantry. There are the rifle regiments, for example, of the infantry divisions. In numbers, this type is most numerous. There are also the motorized regiments of infantry of motorized divisions; armored regiments which are an organic part of armored divisions; parachute infantry; air-borne infantry; and infantry of the mountain regiments. There is great diversification within the infantry regiment of any type. There is the rifleman, the light machine gunner, and the operator of the 60-mm mortar; the machine gunner and the 81-mm mortar operator of the heavy weapons company; members of crews of the 37-mm antitank gun and guns of other calibers; truck drivers; radio and telephone men; Intelligence personnel; supply personnel; clerks and typists; cooks, and many others. The regiment includes attached medical personnel who retain their identity as members of the Medical Department but are members in fact of the regiment they serve.

While infantry is the arm of close combat, it must not be pictured as fighting alone or operating alone. It works inseparably with field artillery and often with air units. Infantry may be said to contribute the power of deception, of maneuver and movement, as well as a considerable firepower in its own right, as it works its way forward by groups or by individuals in the attack, or clings tenaciously to ground held or won in the defense. Field artillery may be said to contribute the power, or muscle of the attack or defense by using its great firepower to assist and support infantry. Nor is this all. Infantry works with combat engineers, with Air Force units which provide support of ground troops, and with the other arms and services as occasion requires in the accomplishment of missions.

The hazards of infantry in battle (as well as the principal task of the medical officer) are sufficiently attested by considering the AEF casualty rates. The battle casualties of the AEF were 260,783; of this total the infantry incurred 229,223 or approximately 88 per cent. The casualty rate per thousand of infantrymen was 583.96. Already, in this new and global war, the blood of infantrymen has been shed in the battles of the nation they serve, in Hawaii, the Philippines, at other distant points in the far east, in Dutch Harbor, and elsewhere. These are precious lives. The medical officer who serves and works with infantry may expect to find full use for the knowledge in his mind and the skills in his hands. He may save lives which otherwise might be lost. If he does his work well he may become the good comrade of men who know war as it is, with its mud and grime, sweat and blood, cold and rain, and awful fatigue.

Organization of Infantry Units. The *squad* is the elementary combat unit. It is the largest infantry unit habitually controlled by the voice and signals of its leader. A well-trained squad constitutes a team capable of resisting and overcoming the hazards of battle and carrying out its assigned mission. The rifle squad consists of a leader, a second-in-command, and five to ten riflemen. Personnel armed with weapons heavier than the rifle are organized in squads for purposes of control. In general, these squads consist of a leader and a gun crew to operate one or more weapons.

The *rifle platoon* is the smallest unit with capacity for deployment in depth and width and endowed with independent power of maneuver. It includes no weapons appreciably less mobile than those of the rifle squad nor any weapons presenting considerable relief in firing position. The platoon is the smallest unit which is commanded by an officer.

The *company* is the basic infantry unit with administrative and supply functions. It comprises a company headquarters and several platoons with the agencies necessary for their control, subsistence, and administration. Companies are classified as combat companies and headquarters and service companies. The company is the appropriate command of a captain.

Combat companies of rifle regiments include rifle companies, antitank companies, heavy weapons companies and the cannon company. The rifle company combines the action of several rifle platoons with that of a weapons platoon. It is the smallest unit which habitually organizes a base of fire in the attack. It contains only elements which

have a normal march mobility approximately that of the rifleman. *Heavy weapons companies* comprise machine gun and mortar platoons.

Headquarters companies are principally constituted by groups charged with collecting information and disseminating orders and instructions. They may include other elements not large enough to justify a separate supply and administrative overhead.

Service companies furnish staff, supply, and transportation personnel, and operate transportation.

The *rifle battalion* is the basic tactical unit of infantry. It consists of a headquarters and headquarters company, three rifle companies, and a heavy weapons company. The battalion constitutes a complete infantry unit capable of assignment to a mission requiring the application of all the usual foot infantry means of action. Organically, it includes no weapon which cannot be manhandled over a distance of several hundred yards. It is commanded by a lieutenant colonel. The details of organization are no longer available for publication.

The *infantry regiment* is the complete tactical and administrative unit. The regimental commander, in addition to coordinating the action of his own units in battle, usually motivates the action of a varying allotment of weapons in supporting arms, particularly artillery. It is commanded by a colonel.

Commanders of infantry regiments and battalions require *staff assistants*. These staff groups are relatively small. The staff of the battalion commander consists of an executive and operations officer (S-3), an adjutant and intelligence officer (S-1 and S-2), and a detachment commander and transport officer. The battalion may be supplied from means available to the regimental commander with a supply officer, a communications officer with personnel to install and operate communications facilities, and a battalion section of the regimental medical detachment, including an officer to function as battalion surgeon. The staff of the regimental commander consists of an executive officer, an adjutant (S-1), intelligence officer (S-2), operations officer (S-3), a supply officer (S-4) who commands the regimental supply service, a regimental surgeon who commands the regimental medical detachment, other staff assistants for functional purposes, and three chaplains.

The term *combat team* is in common usage in field operations. It consists of an infantry regiment, a battalion of light field artillery, and such other units as may be prescribed by the division commander. The expression "CT 21" means the 21st infantry with the supporting and service elements which accompany it as standing operating procedure.

Designation of Units by Number or Letter. The battalions are numbered. Companies are lettered or named. The units of the infantry regiment are designated as shown below:

Regimental headquarters

Headquarters company

Service company

Antitank company

Cannon Company

1st battalion:

Battalion headquarters and headquarters company

Company A (rifle)

Company B (rifle)

Company C (rifle)

Company D (heavy weapons)

2d battalion:

Battalion headquarters, headquarters company, companies E, F, G (rifle), and H (heavy weapons)

3d battalion:

Battalion headquarters, headquarters company, companies I, K, L (rifle), and M (heavy weapons)

Regimental medical detachment (attached)

Chaplains (attached)

Infantry Weapons. The weapons furnished the rifle company are designed to satisfy the special missions of this unit. It is the infantry unit which leads the way in attack, and holds the most advanced positions in defense. The weapons are the rifle, the automatic rifle, light machine gun, 60-mm mortar, and the bayonet. The automatic pistol or carbine is carried by some members of the company. Hand grenades are used on short-range missions. The rifleman fights on foot. Motor transport is used to place him quickly at a location close to the battle area, to supply him, and to evacuate his casualties. All weapons of the rifle company are carried by hand, and, except for supply of ammunition, transport is not required in battle. The weapons are light in weight, capable of a high volume of accurate fire, and reach their greatest effectiveness at relatively short ranges.

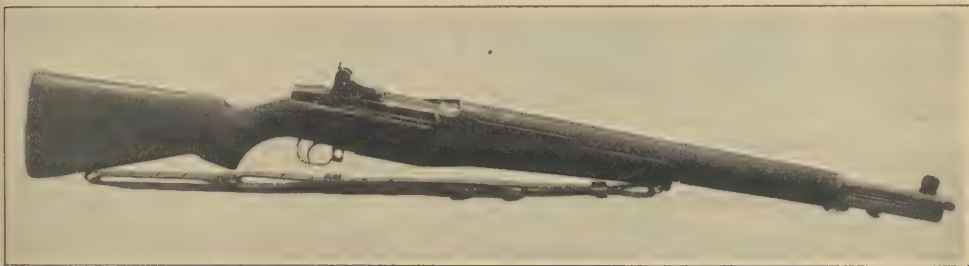


Plate 2. The Rifle.

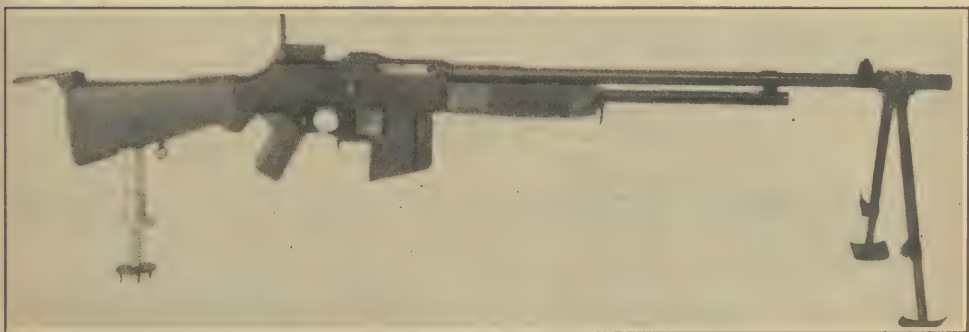


Plate 3. The Browning Automatic Rifle.

The intrenching tool is an important article of equipment of the infantry soldier. With few exceptions he is equipped with some form of portable tool: shovel, pick-mattock, hand ax, or wire cutter.

The heavy weapons company provides supporting fires for rifle companies of the infantry battalion. This may involve adding to the intensity of their fires to assist in gaining fire superiority, or engaging targets which are beyond the range or capabilities of rifle-companies weapons. The weapons provided are the caliber .30 machine gun (8 MG's), and the 81-mm mortar (4 mortars). The caliber .50 machine gun, truck mounted, is used for antiaircraft missions. The machine guns provide a high volume of flat-trajectory fire which can be employed effectively by day or night, in fog, rain or smoke, in any condition of weather or visibility. These characteristics are available because of the tripod which provides a fixed mount, enabling fire to be delivered in any predetermined elevation or direction. While the principal method of fire delivery is by direct laying, in which the target is visible to the gunner, the machine guns may also be used effectively for indirect laying when the target is invisible to the gunner, by the use of instrument or map-firing methods. Machine guns support rifle units from positions abreast of their advanced elements or from positions in their rear or on their flanks. Fires from rear positions are delivered through gaps between rifle



Plate 4. The Light Machine Gun.



Plate 5. The 60-mm Mortar.

units, by overhead fire, or to points outside their flanks. Many members are armed with the carbine.

The 81-mm mortar is a high-trajectory weapon using a heavy shell with a bursting radius substantially equal to the 75-mm light artillery projectile, and a lighter shell which reaches to much greater ranges with a reduction in bursting effect. The weapon is used to engage enemy targets in areas in defilade from flat-trajectory weapons such as targets on reverse slopes, ravines, and trenches.

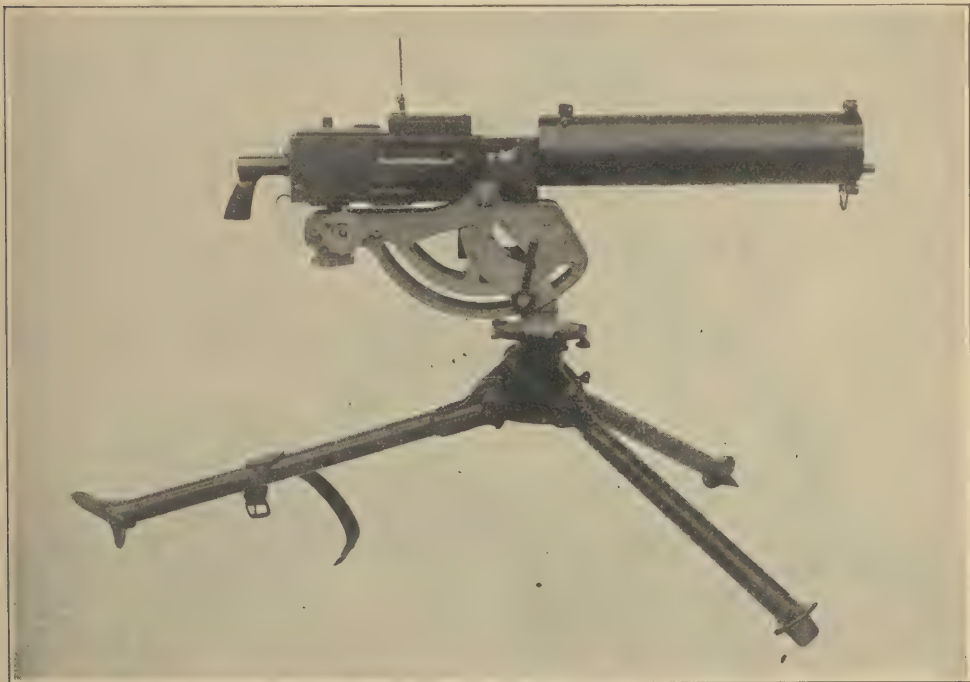


Plate 6. Machine Gun, Caliber .30.

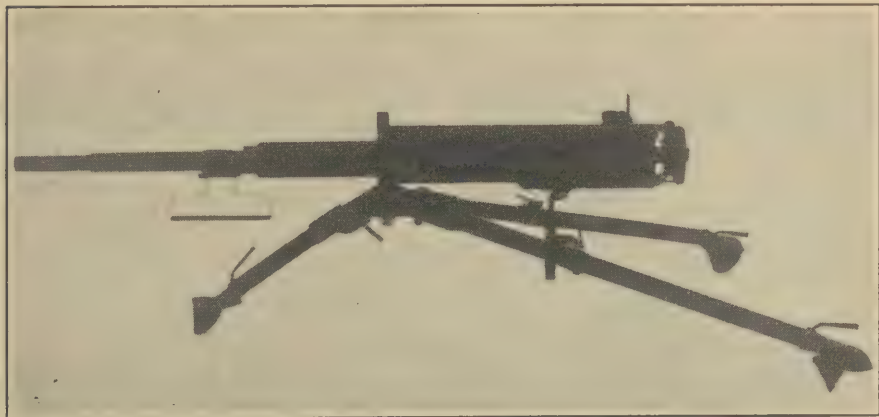


Plate 7. Machine Gun, Caliber .50, with Ground Mount.

Infantry heavy weapons may be moved by hand for short distances without undue fatigue or for long distances with sacrifice of speed and with fatigue losses. They are provided with transport for battle movement and displacement as the action pro-



Plate 8. 81-mm Mortar.

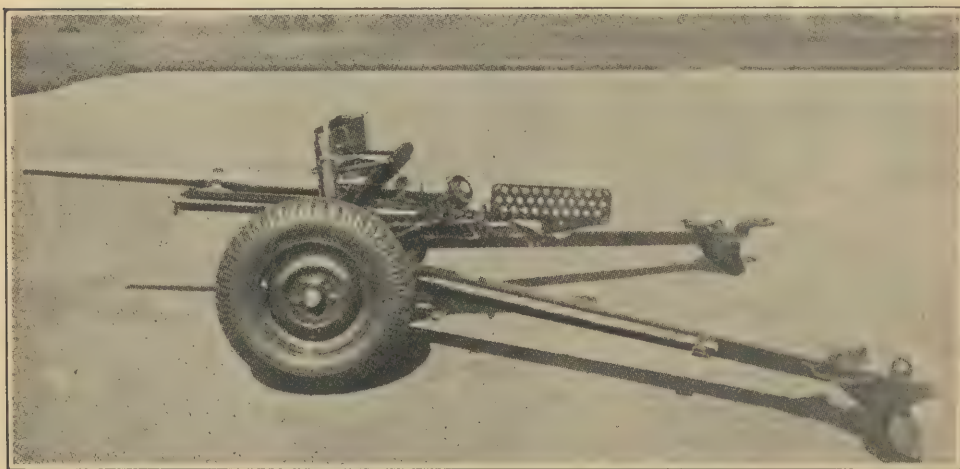


Plate 9. The 37-mm Antitank Gun.

ceeds. Trucks and pack mules are employed. Transport is also required for ammunition supply.

The antitank company and the battalion are each furnished the 37-mm antitank gun. It is used to engage hostile mechanized vehicles, including tanks. The company is organized into three platoons, each of which operates four AT guns, a total of twelve guns. Truck transport is required for moving this weapon except for short changes of position incident to changes of firing position.

Other weapons used by infantry such as the weapons of the cannon company and carbine have not been released for publication. It may be said, however, that the carbine is a light weight hand weapon which replaces the pistol; it possesses great ruggedness, delivers a high rate of accurate fire and is effective at sufficient range to provide a major contribution to infantry on the battlefield.

Weapon	Caliber (inches)	Maximum range (yards)	Service effective range (yards)	Weight of piece (pounds)	Usable rate of fire (per minute)	Weight of ammunition
Rifle, M1 (Garand) ....	.30	5500	1000	9.4	15-30	1 ounce
Rifle, M1903 .....	.30	5500	1000	8.4	7-10	1 ounce
Automatic rifle .....	.30	5500	1000	17.1	40-60	1 ounce
Machine gun .....	.30	5500	3500	82.0	250	1 ounce
Machine gun .....	.50	7500	5000	128.0	250	4 ounces
37-mm AT gun	1.4	7500	1600	850.0	15-20	4 lbs.
60-mm mortar	2.4	1300	1000	51.4	30-35	2.4 lbs.
81-mm mortar	3.2	3280	2000	134.0	30-35	7.2 lbs.
			1500		30-35	15.8 lbs.
Pistol .....	.45	1600	50	2.4		1.5 ounces
Hand grenade		50	50			1.3 lbs.

Plate 10. Characteristics of Infantry Weapons.

Communications, Supply, and Evacuation. Communication facilities of the regiment of infantry include telephone, telegraph, radio, and messenger service. The headquarters company contains the communication platoon with four sections which install and operate the facilities. Each battalion has personnel to operate its own message center. Sections are provided for regimental headquarters and, when required, for each of the three battalions.

The service company contains a transportation platoon with a section for each battalion, and non-lettered companies of the regiment. This arrangement pools all transportation available to the regiment, except tactical vehicles which remain with the organizations to which they are issued.

The regimental medical detachment (attached medical personnel) initiates evacuation of the sick and wounded. For functional purposes it may be divided into a regimental section and three battalion sections. Each section is staffed and equipped to set up and operate an aid station at which casualties are assembled and prepared for evacuation.

Basic Factors of Infantry Combat. As infantry is the arm of close combat, it operates in the zone of intense hostile fire. This obliges infantry to adopt extended formations and to take the fullest advantage of the terrain in order to reduce the degree of vulnerability. Even small tactical units are distributed over a considerable area, and battlefield control is difficult. Infantry subordinate leaders see only a small portion of the battlefield and often fight in ignorance of the general situation and the major results obtained. They direct the local combats which make up the battle, the sum of which constitutes success or failure.

Fire and Movement. Foot infantry has two principal means of action: fire and movement. There must be the closest possible coordination between them in order that infantry may close with the enemy and break his resistance. Fire destroys or neutralizes the enemy and must be used to protect all movement in the presence of the enemy not masked by cover, darkness, fog, or smoke. Through movement, infantry places itself in positions which increase its destructive powers by decrease of the range, by the development of convergent fires, and by flanking action.

Movement. Infantry is adapted to movement on all kinds of terrain. Its ability to move in small and inconspicuous formations minimizes the effects of hostile fire and permits the use of covered routes of approach for its advance, and minor accidents of terrain as firing and cover positions. Motorized weapon and ammunition carriers are used to maintain battlefield mobility of heavy weapons.

Fire. The fires of the various infantry weapons require coordination. The flat-trajectory weapons pin the enemy to the ground and cause him to seek shelter; the fire of curved-trajectory weapons reaches an enemy protected from flat-trajectory fire. Frontal fires directed upon an enemy combined with flanking fires produce destructive convergent fires.

Field of fire. The field of fire is the area throughout which fire can be delivered from a single firing position. Good fields of fire are to be found in level or uniformly sloping terrain unbroken by vegetation which might conceal an enemy from view and free from terrain formations which provide the enemy with defilade from fire.

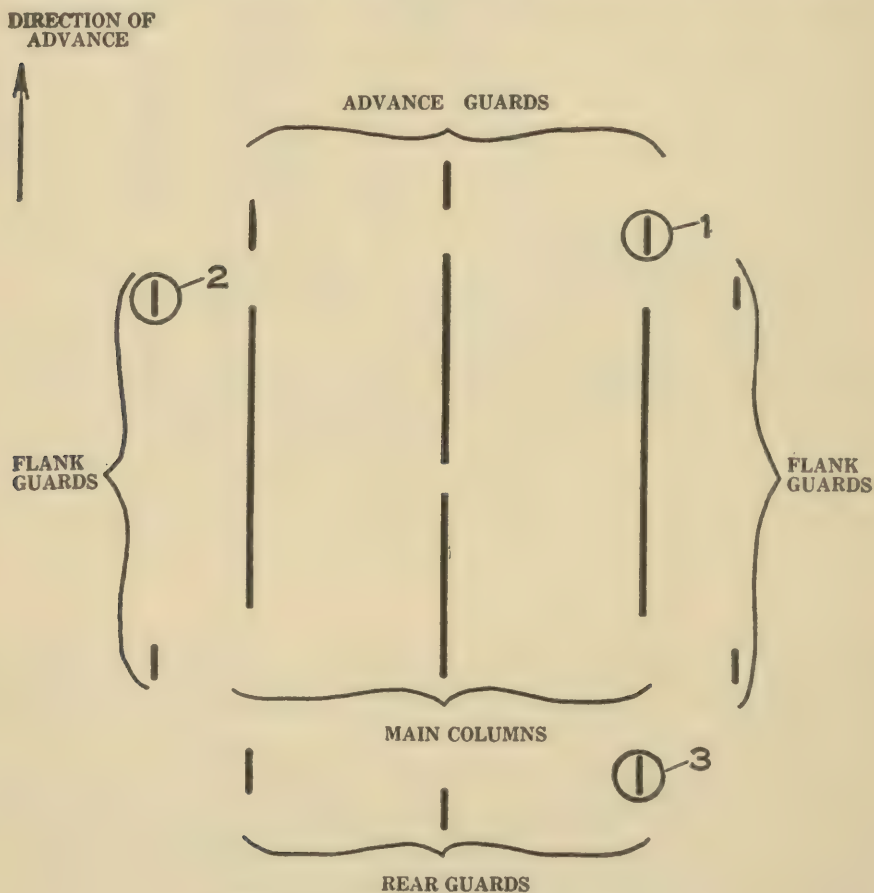


Plate 11. Area of Marching Columns.

Base of fire. In the presence of the enemy, infantry seeks to protect its movements by fire action including a *base of fire*. The organization of a base of fire comprises establishment of the attacking echelon on a departure position; emplacement of the supporting weapons of the unit in firing position to support the advance of the attacking echelon; synchronization of the debouchment of the attacking riflemen with the fire of the supporting weapons from the base of fire. The rifle company is the smallest unit which habitually employs a base of fire in the attack.

Terrain. Terrain exercises an important and often a decisive influence in tactical operations. It usually dictates the dispositions of infantry units and their plan of maneuver or defense plan. Small infantry units have only a limited latitude in the choice of the terrain of operations. They must make the best possible use of the terrain of the zone of action or sector to which they are assigned.

Gently sloping, open terrain permits full use of the flanking action of flat-trajectory infantry weapons and hence increases the power of the defense against infantry attack. Conversely such terrain offers little cover to attacking foot troops but favors tank attack. Strong tank or artillery support is required to permit infantry to attack successfully over such terrain without severe losses.

Broken terrain limits the defender's field of observation and flat-trajectory fire and offers cover by which attacking foot infantry may approach a hostile position. Defensive positions located on terrain of this character require increased density of occupation of forward defensive areas and an increased allotment of curved-trajectory weapons.

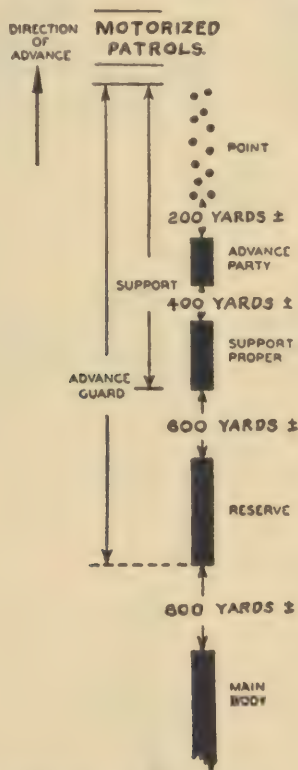


Plate 12. Advance Guard.

Rolling terrain affording some cover and facilities for observation is the most favorable for attacking foot infantry. Crests, ridges, woods, or other features which extend generally parallel to the direction of advance divide the terrain into corridors which are natural avenues of penetration. The visible horizon will therefore usually delimit an infantry maneuver phase and often constitutes an initial objective. Long, narrow terrain compartments which lead in the general direction of a defensive area form advantageous corridors for attack.

Infantry in Security. The cardinal military sin is to allow one's self to be surprised. Security measures must be taken if surprise is to be avoided. The measures must be continuous, in camp or bivouac, on the march, and during battle. *Advance guards, flank guards, rear guards, and outposts*, as the situation may require, are provided

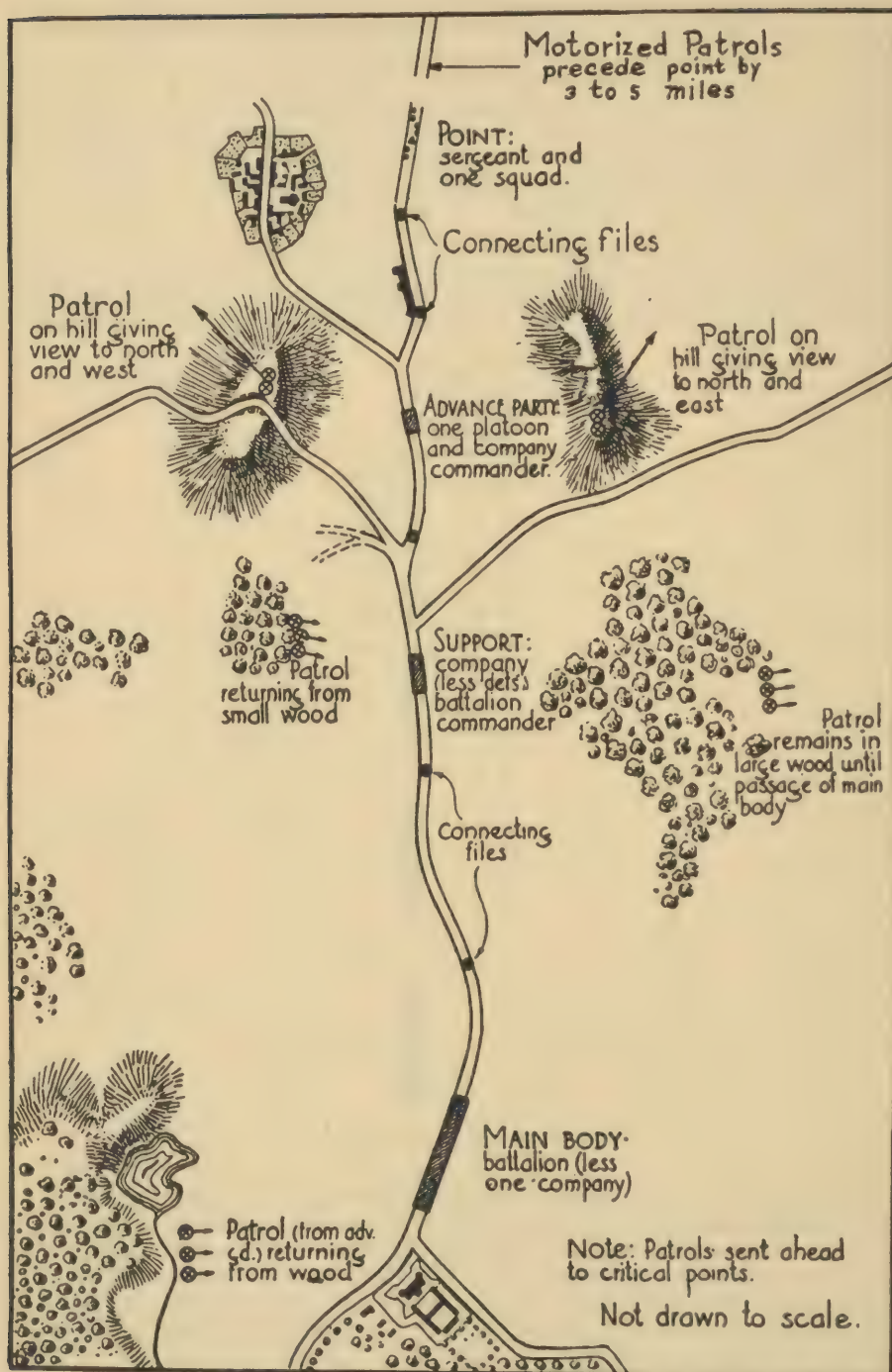


Plate 13. A Company of Infantry as an Advance Guard to a Battalion in March.

for the purpose. It would be rare to use more than one-third of the strength of a command in security missions.

The *advance guard* is a force sent out to the front to precede and cover the main body on the march. It prevents the enemy from observing and firing on the main body, maintains the proper direction of march, and removes obstacles from the route to facilitate the march. When resistance is encountered the advance guard takes prompt and aggressive action to dislodge the enemy and provide for the uninterrupted advance of the main body. If the resistance is too strong or too extensive to be thus overpowered, the advance guard fixes the enemy in position, locates the flanks of the enemy, and facilitates action which may later be required by all or a portion of the main body. The advance guard consists of the *point*, *advance party*, *support*, and *reserve*. A small advance guard may omit the reserve. Connecting files consisting of one or two men provide communication and contact between elements of the advance guard. *Flank guards* and *rear guards* protect the flanks and rear of the main body in a similar manner. Elements of the advance guard are separated so that, for example, in an advance guard as large as a battalion with artillery, the point might be as much as $3\frac{1}{2}$ miles in advance of the head of the main body. In rugged or wooded terrain and at night, distances are reduced.

When possibility of contact with an enemy is remote, the advance guard will march on roads, in suitable formation, and utilize patrols to investigate areas of potential danger which might conceal an enemy. This obtains the maximum rate of advance.

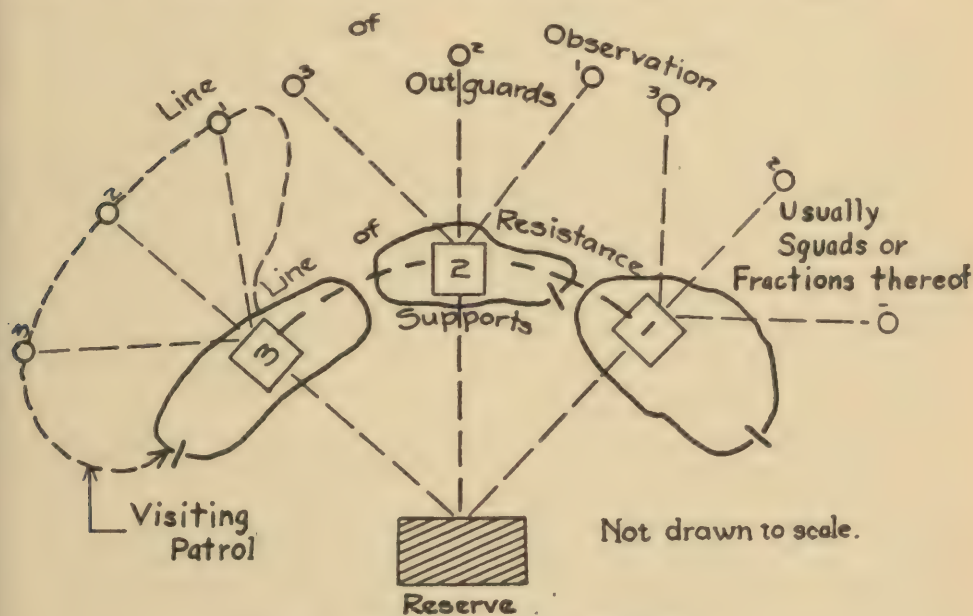


Plate 14. Diagram of Outpost Dispositions.

When possibility of contact with an enemy is imminent, advance guards deploy so that they cover the entire zone of advance of the marching column or columns. Many of the elements must now march across country, and accordingly the rate of march is materially decreased. A zone of advance is prescribed, limited by lateral boundaries. Forward progress is limited by phase lines prescribed by the superior commander. Should contact with an enemy be made, the advance guard is partially deployed, the entire area can be searched for hostile groups, and offensive action may be taken promptly. This procedure is similar to approach march in attack and the procedure obtains maximum security as well as great readiness for action.

In general, *flank guards* and *rear guards* adhere to the same principles of organization and operation as advance guards. They are to prevent an enemy from gaining

contact with the main body or from interrupting the movement of the main body. Motor transportation is especially useful for flank guards and rear guards.

No system of security is any better than its warning service. In fact, an advance guard is itself a warning service since its mission serves to prevent a surprise attack against the bulk of the force before it has prepared itself for action. A warning system is necessary to protect against air attack and mechanized attack. Motorized reconnaissance detachments operating well to the front and flanks are especially suitable. Whatever the means employed, an intelligence and signal communication system carefully coordinated must be provided. Within marching columns there should be men especially designated to watch for hostile threats from air or ground and give warning. Members of all units must be taught to apply measures effectively and quickly which will reduce or nullify the effect of sudden attack. The alert commander will foresee the ever present chance of enemy action and be prepared constantly to meet it.

The *outpost* protects the main body while in camp or bivouac. A column halted for a period longer than the hourly rest is protected by a *march outpost* constituted at once by the advance guard.

Troops in camp or bivouac are protected by part of their number forming the outpost so that they may rest without the hazard of sudden and unexpected attack. Areas of definite responsibility are assigned to units of the outpost designated as *supports*. Each support sends out small detachments to important terrain localities where they remain in observation. Active patrolling is maintained between supports and their units in observation, for further protection. A *reserve* is held under the control of the outpost commander for disposition in case any part of the outpost line is threatened. An outpost defends or withdraws into the main position in accordance with orders of the commander of the main body. See Plate 14.

Infantry in Attack. In an attack, an infantry unit may be placed in "assault," which means that it leads the advance, or it may be held in "reserve." The commander of an infantry regiment, for example, may place two of his three battalions in assault and hold one in reserve; or place one in assault and hold two in reserve; or, in rare instances, the entire regiment less one rifle company in assault, the one company constituting the regimental reserve. In a similar manner an infantry battalion commander would prescribe assault or reserve missions to his three rifle companies, and the rifle company commander would dispose his three rifle platoons. The heavy weapons company and the weapons platoon would support (i.e., assist with fire action) the assault units of the battalion and company, respectively. The heavy weapons company of an assault battalion is not usually held in reserve.

This organization for combat of an infantry unit depends upon the mission, the terrain, and the capabilities of the enemy. In an obscure situation where little is known of the enemy the commander will wish to commit minimum strength to the assault in order to retain a strong reserve. When the advance is made within a wide zone, especially in broken, wooded, or rugged country, he will likewise prefer to retain a strong reserve. A regiment making the main attack will need a strong reserve element in order to have forces available to extend an envelopment, or pass through an assault battalion in order to continue the action with fresh troops, or to counter quickly actions which may be launched by the enemy. On the other hand, a regiment which is making the holding attack is not expected to penetrate deeply into the enemy position; it will need to develop its maximum power quickly to prevent the enemy from moving to meet the main attack, and to give the impression that the main attack is launched on his front. In such a case the commander will hold a weaker reserve. The organization for combat depends upon the mission assigned the infantry unit, the capabilities of the enemy, the width of the zone through which it is to advance, and the nature of the terrain.

Rifle companies of assault battalions "carry the fight to the enemy," but they do not fight alone. An overwhelming fire or tank support is usually required to permit an attacker to advance against strong resistance. The heavy weapons company provides strong fire support with its machine guns and mortars, placing the fires where

they will be of the greatest help to the assault units. In a similar manner and for the same reasons the weapons platoon of rifle companies assists the rifle platoons with fire support, using the light machine guns and 60-mm mortars. The rifle platoon has automatic rifles which it may employ to assist the squads. It is an application of the principle that infantry operates by combining "fire and movement," which means that a portion of a unit forms a base of fire and fires upon an enemy position in order to gain or maintain fire superiority while the remainder moves or maneuvers through concealed or defiladed routes to approach closer to the immediate objective. All of the weapons available to the battalion commander or rifle company commander are employed in a coordinated action to reach the objective, as the first goal, and then, as the second, to reach it with minimum casualties and in the quickest time.

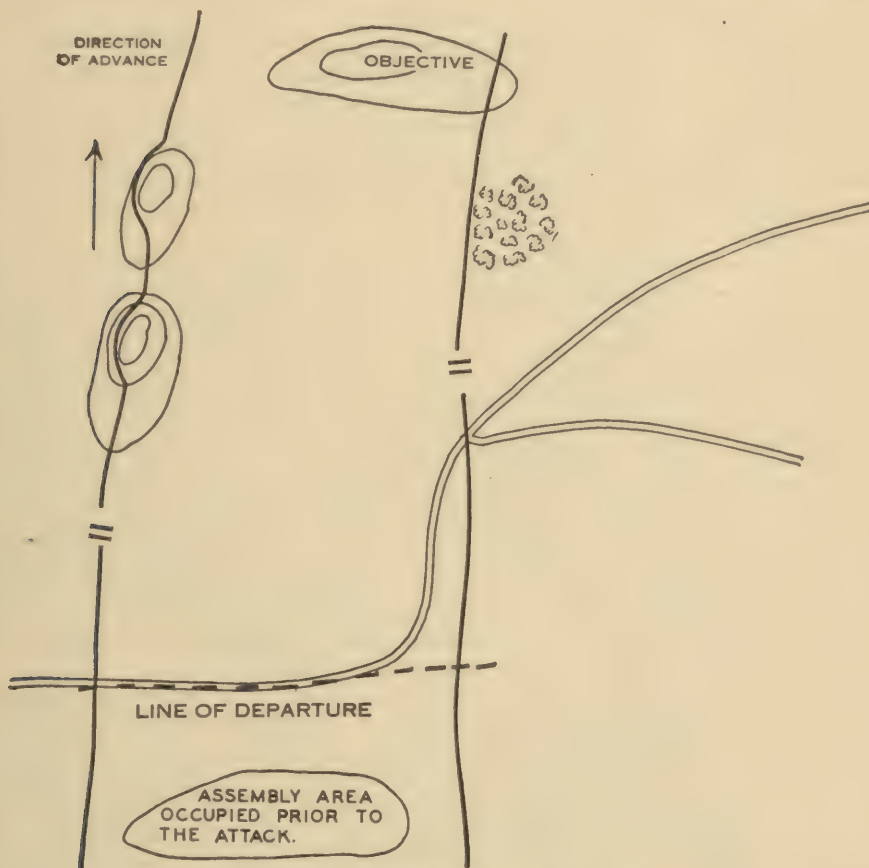


Plate 15. A Battalion Zone.

An infantry battalion in assault operates, in the usual case, within a zone of action. This zone includes the line of departure from which the attack will start; the objective, or destination, or goal of the advance; and, for interior battalions, a right boundary and left boundary. A battalion on the right flank of a larger force may have only a left boundary with no restrictions as to the area of movement on its right. Boundaries are prescribed only where necessary to assist coordination of adjacent units. For small units, such as the infantry battalion, boundaries should be outlined by clearly visible objects to prevent the likelihood of loss of direction and straying into the zone of action of an adjacent organization. The orders for the attack prescribe the line of departure, the objective, and the boundaries if any are necessary.

The order also prescribes the time of attack at which assault units leave the line of departure or cross the line of departure. Prior to the time set for the attack, battalions often occupy an "assembly position" in rear of the line of departure where many arrangements are made which may include partial issue of orders, feeding the troops, issue of extra ammunition, and dropping of packs. Somewhat in advance of the time of attack, units are moved forward to the line of departure. Here appropriate formations are taken to start the advance, final orders are issued, supporting weapons are emplaced, and coordination completed, all in time to start the advance at the time prescribed. At other times these arrangements are completed so as to cross the line of departure at the proper time without halt or pause. It is essential that small units understand, before the start, their destination or the objective they are to reach, the route they are to follow (limits of the zone of action), and the initial formation they are to use. After the start, events will control their action.

The *main effort* of a unit aims at securing ground, the possession of which will facilitate the capture of the objective, the destination of the hostile force, or the advance of other elements. It is usually made against a weak area in the hostile dispositions.

Infantry rifle units pass through the following phases in an attack which is launched from a line of departure outside the area of contact: the *approach march*, the *fire fight* or *conduct of the attack*, the *assault*, and the subsequent operations among which will be reorganization, defense or preparations to defend the position captured, resumption of the attack, or pursuit.

The *approach march* is the advance forward, in suitable formations, from an assembly area through the zone of hostile artillery fire to and across the line of departure. Leading infantry units are preceded by scouts who search for enemy positions, forcing him to disclose himself. Formations are used of minimum vulnerability and maximum ease of control which also facilitate the skillful use of cover. For example, a platoon might advance in line of squad columns, the members of each squad following generally behind the squad leader who is responsible, within limits, for selecting the best and safest route. Within squads the men are separated in depth, and the squads are separated by intervals as great as fifty yards. Dangerous areas are avoided. Fire-swept areas which cannot be avoided are crossed as quickly as possible with minimum exposure. Rifle units do not fire during the approach march but seek to advance rapidly with minimum exposure. The fires delivered, if any, are from infantry heavy weapons and artillery. The approach march ends when the effectiveness of hostile fire makes it necessary for rifle units to return the fire with their own weapons and obtain fire superiority in order to continue the advance without suffering ruinous losses. Rifle fire is not ordinarily opened at ranges beyond 400 yards.

In the *conduct of the attack* rifle units seek to combine their fires with those of the supporting weapons. The combined fire action creates the conditions which make possible the movement of the attacking echelon. The rifle units exploit these conditions by alternate fire and movement. While some of the riflemen open fire to hold down the fire of the enemy resistances, others advance from one cover or firing position to another. Every lull in hostile fire is utilized to push groups to the front and occupy points from which covering fire, particularly the flanking fire of light machine guns, will facilitate the further progress of attacking units. The infantry supporting weapons, displacing forward when necessary, cover the advance of the rifle units to close range, protect their flanks, and assist in the reduction of hostile resistance. Infantry action continues in this manner until hostile resistance is broken, advancing by bounds on successive terrain features or objectives where the fire support for the next advance is arranged. In such action the importance of the small units and the leaders of small units should be apparent. Along the extended front of a large force in an offensive operation there are a large number of these actions, each striving to overcome the hostile resistance, and each seeking to advance upon its objective.

During the progress of the attack, commanders will employ the units held in reserve. For example, assume that an assault rifle company has been stopped by hostile resistance which it cannot avoid or overcome. The battalion commander, after calling for such supporting artillery fires as are available and providing for the support of the

heavy weapons of the battalion, might direct a reserve company to maneuver to strike the resistance from a different direction, or avoid it and pass on toward the objective, or add its fires to the troops engaging the enemy and then pass through them to become the assault company, whichever seems most likely to achieve the success. He will not employ his reserve piecemeal, or fritter it away in dribblets, but use it to make a strong, coordinated blow.

In this manner the advance is continued by infantry units. By fire action they seek to neutralize the effect of the hostile resistance. By movement they seek to occupy his position. It must be seen that the action is controlled and coordinated by commanders of successive echelons and that assault units are given all possible support by infantry heavy weapons, by artillery, and by tanks to precede assault rifle units when tanks are available.



Plate 16. Successive Objectives.

The *assault* is the final advance into an enemy position. It may terminate in hand-to-hand fighting. There is no set distance from the enemy position at which the assault is begun. Supporting fires are shifted to other targets which do not endanger the attacking friendly troops. The assault is a very critical period.

Following a successful assault, troops occupy the captured ground, prepare to resist counterattack, reorganize, replenish ammunition, and prepare for the next action which may be a continuation of the attack, pursuit, or defense.

Attack frontages for the infantry battalion depend upon the nature of the terrain, the mission, the nature of enemy organization, and the actual combat strength of the subordinate units. As a basis of comparison, a battalion making a strong attack against an organized position may advance within a zone 600-1000 yards in width. Against a hastily organized position in which somewhat less resistance is to be expected the zone may be

increased to a width of 700-1000 yards. A battalion making a holding attack or secondary attack may advance within a zone of 900-1200 yards.

Attack zones of action are sought which provide terrain corridors, such as stream valleys, leading towards the objective. Such avenues of advance provide natural cover and defilade. When the advancing unit is able to control the ridge lines bounding the corridor they can reduce or eliminate the hazard of flanking fire.

Direct support artillery (light artillery) operates in close coordination with attacking infantry as a combat team. Fire is delivered upon enemy areas which are holding back an infantry advance, or which threaten to do so. An artillery liaison officer and detachment with communication facilities accompanies each assault battalion. This agency communicates requests for artillery fire, designates the exact location of suitable targets, and may observe the fire to communicate at once corrections in firing data to move the fire into the area desired. For example, a company commander of an assault unit may encounter a strong enemy position over which he is unable to secure fire superiority. He should call upon his battalion commander for fire support. The battalion commander will cause fires to be delivered from the battalion heavy weapons company and, if desirable, will request the artillery liaison officer to place fire upon the target. In an extreme case this request may result in fire into the area from artillery supporting adjacent units and in fire from medium artillery in general support of the entire force.

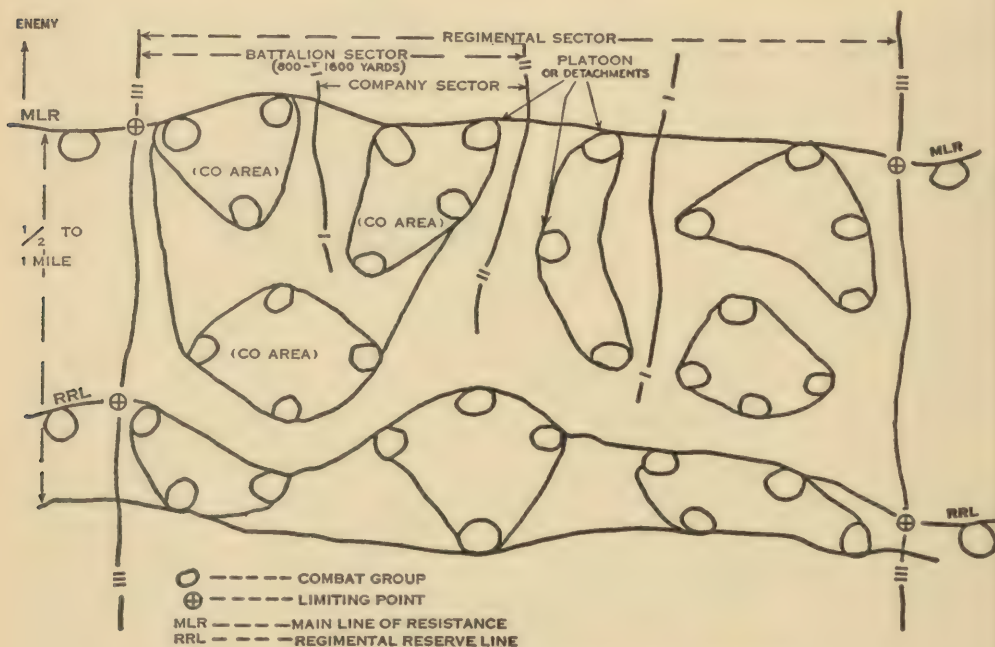


Plate 17. Diagram of a Regimental Sector in Defense.

Infantry in Defense. In the defense, infantry units may be assigned to defend a sector, or defense area, on the main line of resistance or be placed in reserve. If in reserve they may occupy a defense area on the regimental reserve line or be held farther back in general reserve for the use of the commander, such as the division commander, when the direction and intensity of the hostile attack are disclosed. The infantry battalion is the "unit of measure" for planning or studying a defensive system. The sector assigned a battalion will usually include an important terrain feature; the size of this sector will depend upon the mission and the terrain. The important factor is that battalions are assigned key points of terrain, in width as well as depth, and these localities, called "defense areas," are then organized to resist attack from any direction.

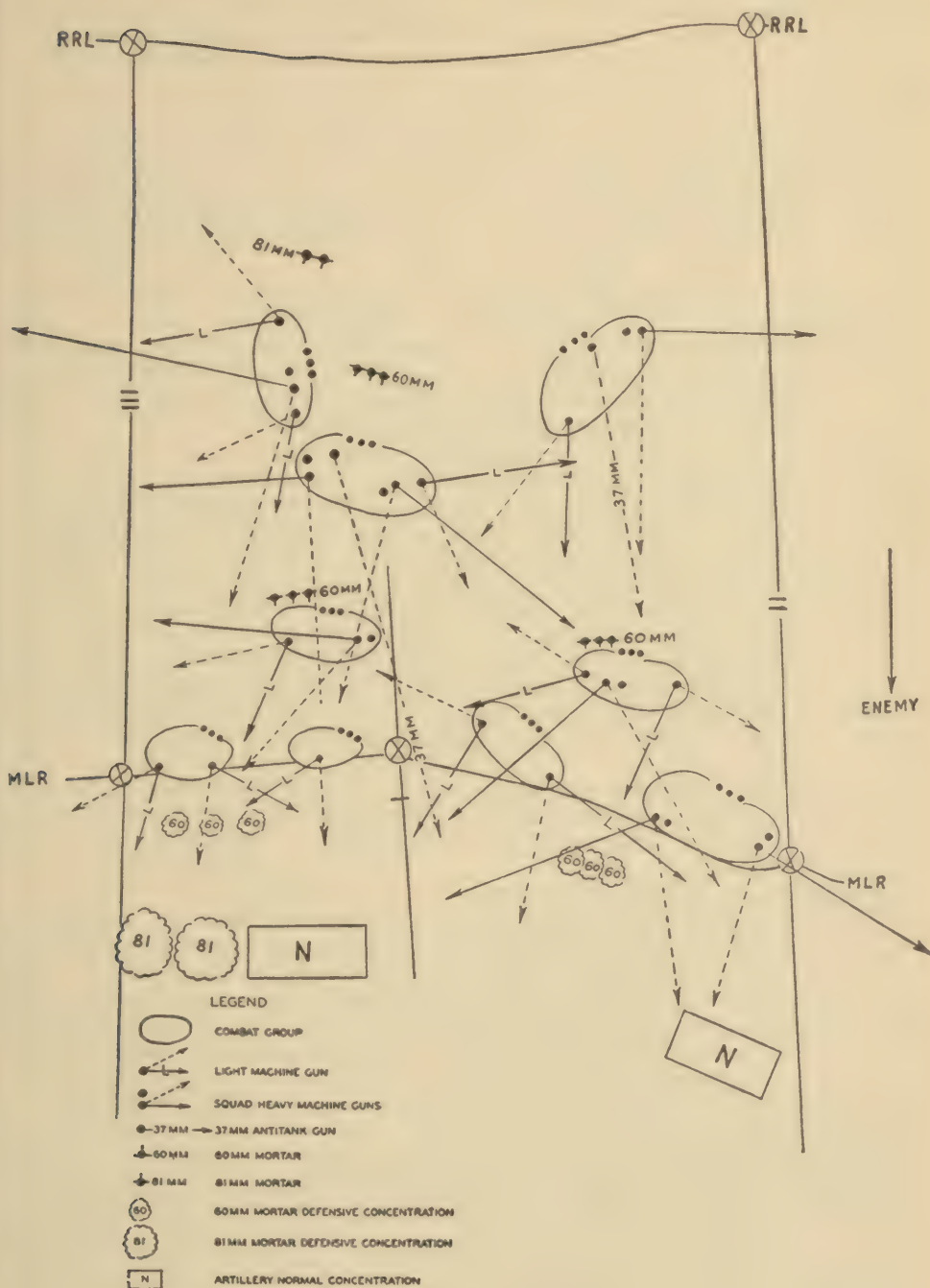


Plate 18. Defensive Fires.

The Automatic Rifles are Located to Cover Gaps in the Fires of the Machine Guns.

Battalion sectors having been designated, the battalion commander provides for the defense by assigning company areas; in turn company commanders dispose their platoons.

The *frontage* which an infantry battalion on the main line of resistance can defend depends upon the mission, the terrain, and the natural obstacles to hostile advance. As a basis of comparison, where the observation is poor and the area is vital a battalion can defend on a front of 800 yards. On average terrain under the same conditions this frontage can be doubled. Where natural obstacles protect a position the frontage can be extended to as great a width as 3500 yards. Under a mission to effect delay on successive positions without becoming decisively engaged, this frontage may be further increased to a width as great as 5000 yards. A natural avenue of hostile approach, such as a terrain corridor leading into the position, should be assigned entirely to one battalion in order to avoid division of responsibility.

The *depth* of a battalion sector depends upon terrain, but it should have a minimum depth of 400-500 yards; it may be as deep as 1200 yards.

The *regimental reserve line* (RRL) is placed ahead of the dominant observation of the locality, and is usually from 800-2000 yards in rear of the main line of resistance.

The *battle position* includes the area between the forward limit of the main line of resistance and the rearmost parts of the regimental reserve line.

Mobile infantry reserves held by the commander to extend the flanks of the battle position or to launch counterattacks, and the supporting artillery, command, communication, supply, and evacuation establishments are placed in appropriate locations behind the battle position.

It must not be inferred that a battalion occupying a sector on the main line of resistance places its units to obtain uniform density. The contrary is the fact. Each rifle company will be assigned an area for defense having width and depth. Key points of terrain are actually occupied. Gaps between occupied areas are defended by fire.

The next step is the organization of the ground and the coordination of defensive fires. Trenches and gun positions are dug to increase safety and defensive strength. Camouflage is executed. Arrangements must be completed to cover the front and flanks of the position with defensive fires by assigning definite targets or definite areas of responsibility to each unit and each supporting weapon. Coordination with supporting artillery and adjacent units is obtained.

An *outpost line of resistance* is established on the next high ground in advance of the main line of resistance so that warning of an enemy approach may be obtained. This consists of small groups. Road blocks may be established as a precaution against attack by mechanized forces.

Demolitions may be executed to further hamper a hostile advance.

Plans for the conduct of the defense, anticipating all hostile capabilities, are developed.

When the enemy approaches the position in attack, machine guns covering the main line of resistance and rifle company weapons open fire when the enemy arrives within ranges which compel him to lift the fire of his artillery to rearward areas. If the enemy succeeds in effecting a close approach to the main line of resistance, all close-in prearranged fires are released. If the enemy succeeds in entering the position, the defender seeks to strengthen and hold the flanks of the gap and counterattack the penetrating elements from the flank rather than attempt to close the gap by throwing troops across the head of the salient.

Antimechanized Defense. Infantry units must be prepared to resist attack or sudden raids by hostile mechanized units. Selection of positions for defense or bivouac will require a consideration of this danger and, wherever it is practicable to do so, advantage will be taken of natural obstacles such as streams, swamps, and other unsuitable terrain features along the front and flanks of the position.

Road blocks defended by antitank guns may be used extensively at bottlenecks such as bridges, mountain passes, and roads through swamps. The use of tank mines further increases the effectiveness of such obstacles.

Demolitions executed along the front and flanks of a position may be used to destroy bridges, culverts, or roads and to increase the difficulty of movement, especially when the works will not be needed for future use of the force.

The infantry weapons which are provided for antimechanized defense are the caliber

37-mm antitank gun and heavier weapons. These guns are sited in depth throughout the battle position. Upon the approach of hostile mechanized units they are engaged at the maximum range and at a high rate of fire.

Combat Teams and Teamwork. The functioning of all infantry units involves the constant application of principles of cooperation and teamwork. Within the rifle company the rifle platoons function with the supporting fires of the 60-mm mortar and the light machine gun under the control of the company commander. Within the battalion the heavy weapons company constitutes a combat team with the rifle companies, all controlled by the battalion commander. Above all this is the infantry-artillery combat team in which direct-support artillery is in constant contact with the infantry units supported; it must be ready to place its strong supporting fires quickly upon areas as requested by infantry battalion commanders.

Thus it should be clear that infantry does not fight alone. The mission of the infantry, however, becomes the mission of the entire force. It is the infantry soldier, particularly the soldier of the rifle company, who goes forward to occupy in person areas held by the enemy. But he is helped in his task by the supporting weapons within the infantry, at times by tanks, by the artillery, and by all other arms and the services. Teamwork between units on the battlefield is an absolute requirement for victory.

CAVALRY

Characteristics. The cavalry arm is equipped, organized, and trained to perform essential missions which occur in combat. Its dominant characteristic, mobility, is gained to a high degree by the use of horses (horse cavalry) or by the use of armored vehicles in which it moves and fights. Because of this mobility it can shift its very material fire power from one tactical locality to another or from one position to another within the same tactical locality. Each type of transport and equipment has its advantages or favorable characteristics, and each has its disadvantages or unfavorable characteristics. Each type of cavalry can operate unaided by the other, if terrain or weather conditions make such use desirable, or they can operate in conjunction with one another.

Horse cavalry can operate under very difficult terrain conditions. It may not be wholly true that a well-mounted, well-trained cavalry unit can negotiate while mounted any terrain which can be traversed by dismounted men, but it approaches that condition more closely than motorized or mechanized units. Horse cavalry reaches its greatest role in difficult terrain where it alone may operate effectively or under conditions where the necessity for speed transcends all other requirements.

On roads cavalry can sustain a rate of six miles per hour by day and five miles per hour at night; for movements across country these rates are reduced to five and four miles per hour, respectively. For short periods these rates can be greatly increased. Horse cavalry in the United States Army has marched over 100 miles in a period of 24 hours. Under forced march conditions, infantry units require approximately 100 hours to march the same distance. The mobility of cavalry varies from about twice that of infantry for long marches to six times that of infantry for distances of a few miles.

Cavalry is sensitive to the conditions of its mounts. The losses in horseflesh incident to battle may be difficult to replace promptly. The deficiency in heavier supporting weapons limits the kinds of combat, especially the defense or attack of organized positions, which it should be called upon to undertake. While mounted action may be feasible under favorable conditions, horse cavalry units habitually dismount to engage in combat, conceal their horses, and fight as infantry.

Cavalry Missions. Cavalry, whether horse or mechanized, should be assigned missions in accordance with its characteristics. Since its dominant characteristic is mobility, assigned missions should require this trait. Furthermore, adequate measures must be observed to retain this mobility. Missions which may be performed by other available troops should usually be avoided as a means of conserving cavalry for the time when other forces will not serve so well. The two types of cavalry may operate in conjunction with one another or independently of one another. Horse cavalry is especially suited to combat in which its mobility may be utilized to fullest advantage. It is not well suited for attack of an organized

position or for a sustained defense of a position. Mechanized cavalry reaches its greatest usefulness on distant reconnaissance missions; it is well suited for wide encircling movements to strike the lines of communication of hostile forces and disrupt their supply and communication facilities.



Plate 19. Cavalry on the March.
(Photo. U. S. Army Pictorial Service.)

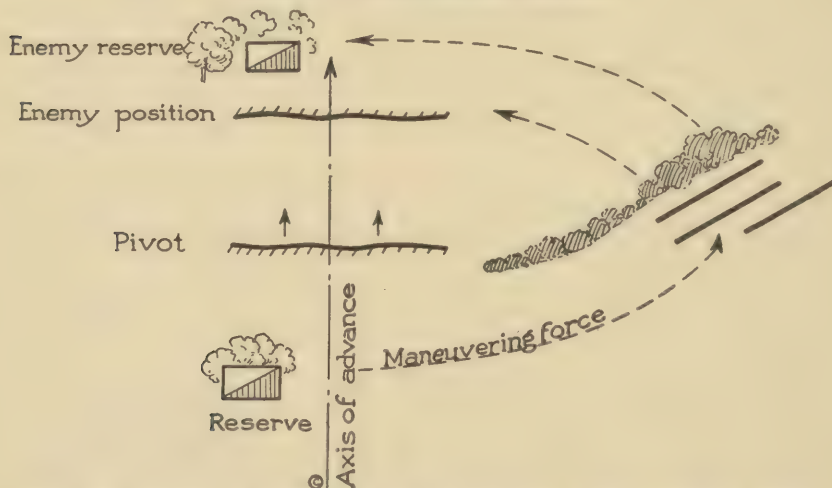


Plate 20. Combined (Mounted and Dismounted) Action, Showing Pivot, Maneuvering Force, and Reserve.

Horse cavalry may be used on independent missions in large units such as a cavalry division or cavalry corps, or it may be employed as a reinforcing unit of an infantry division or corps. In the latter case units less than a division, as appropriate to the conditions to be expected, would be attached as required. Reinforcing cavalry units are especially useful in open warfare for reconnaissance and counter-reconnaissance, for flank protection, for security missions, for delaying operations, for prevention of hostile ground reconnaissance, for intervention in the decisive stage of a general attack, and in pursuit.

Reconnaissance. Cavalry is especially well suited for reconnaissance missions. Acting alone it can search areas in detail far to the front or flanks to determine the location strength, and disposition of hostile forces. In conjunction with air units it can maintain contact with hostile forces whose positions have been discovered from the air and search areas over which air reconnaissance may not be entirely effective, such as in dense woods.

Counterreconnaissance. The purpose of counterreconnaissance is to prevent effective hostile reconnaissance by ground forces. Often the mission assigned to cavalry for this purpose is to prevent hostile reconnaissance beyond a specified line. It is disposed along an extended front in points of good observation and in positions blocking roads and defiles.

Security. Cavalry units may be used in the service of security of larger forces while in march or bivouac. In the execution of this mission they search areas well to the front of the main force to make certain that large hostile forces are discovered and engaged. While this does not relieve the main force of providing its own security measures, it adds greatly to the safety against hostile attack in force.

Delaying action. Cavalry is well adapted to engage large hostile forces to effect delay. It can deploy on a relatively wide front, engage approaching hostile columns with fire, and force them off roads into deployed formations and into position for attack. It can then move rapidly to new positions in rear and repeat the action without becoming decisively engaged. By this process hostile reinforcements may be kept out of the main engagement, or time may be gained to permit the main force to complete a projected operation such as a retirement, occupation of a defensive position, or other action, without enemy interference.

Pursuit. Cavalry is especially well adapted to pursuit. A defeated enemy will seek to withdraw from contact, retire to a place of security, and reorganize for further action. At this stage they are most vulnerable to final defeat and destruction. Cavalry units may move rapidly to harass their flanks or move to key positions in their rear and block the retreat, thus permitting other forces to complete their destruction.

Attack. In advancing to the attack cavalry units move mounted until circumstances require dismounted action. After that point the mounts are concealed and the units operate in a manner similar to infantry units of comparable strength. The led horses are advanced by bounds as the advance progresses in order to have them available for use when required. As the characteristics of cavalry make it more suitable for attack by envelopment than by penetration, it may employ rapid mounted maneuver to reach suitable attack positions from which to attack by dismounted action. In an attack of hostile infantry, cavalry seeks to avoid the enemy's greater power and, by utilizing its superior power of maneuver, strikes where the defender is least prepared to resist. A noteworthy capability of cavalry is action with widely separated detachments without fear of defeat in detail because of the speed with which units can concentrate or move away from contact if such action is indicated.

Defense. Cavalry is well adapted for missions involving seizure of a position and its defense pending the arrival of other forces. It is not well adapted for defense of a position during a prolonged period.

Support of Other Arms. Cavalry units are organized into squads, platoons, troops, squadrons, regiments, brigades and divisions. In combat they require the support of artillery, engineers, and signal troops, and of air force units for distant reconnaissance, liaison, control, and communication. Likewise, the cavalry division needs the essential services performed by the quartermaster corps for supply and transportation, and the services of ordnance and medical units.

Organization of the Horse Cavalry Regiment. (TO 2-11, April 1, 1942.) The regiment of horse cavalry consists of the following components:

Regimental Headquarters and band, if band is authorized.

Headquarters

Service Troop

Weapons Troop

Two rifle squadrons. A rifle squadron consists of three rifle troops, each troop having a troop headquarters, three rifle platoons, and a light machine-gun platoon.

Squadrons are designated by number, as 1st, 2d. Rifle troops are designated by letter, in one series throughout the regiment, as Troop A, Troop B. The term *troop* is analogous to the term company of infantry, medical units, and others, and to the term *battery* of corresponding units of field artillery. A captain is the grade of the commander of most troops, batteries, and companies.

FIELD ARTILLERY

Mission. Field Artillery has a dual mission in battle. *First*, it assists infantry, cavalry, or armored units in contact with an enemy by engaging its great fire power against those targets most dangerous to the supported troops. *Second*, by the use of its range it gives depth to combat by firing upon targets beyond the range of infantry or cavalry weapons such as the hostile artillery (counterbattery fire), his reserves whether on the march or in bivouac, and his agencies for command, supply, and communication.

The division or higher commander is able to use the artillery as a powerful tool to affect the outcome of battle as it progresses. Because of the considerable ranges at which it can fire effectively and the speed with which the direction of fire can be shifted, fires may be concentrated at any desired point throughout a zone of great width and depth. Therefore, as targets are discovered or new threats develop, at least a portion of the artillery may shift to engage them.

Characteristics of Artillery. Artillery acts by fire alone. It is especially useful against exposed hostile personnel, particularly when it is in compact formations. It is able to destroy targets which are invulnerable to infantry or cavalry weapons such as concrete emplacements, stone houses, cellars, bridges, and protected shelters. Plate 21 shows the trajectories of the artillery weapons. It has the ability to converge its fire, from many widely separated positions, to obtain an overwhelming hurricane of fire with violent surprise effect upon one critical or sensitive point of the enemy's organization. Artillery positions are relatively stable, since by making use of its capability of delivering fire at long ranges it can continue to provide support for advancing troops by advancing only its personnel in observation with their communication facilities. Its moral effect upon the troops supported is a valuable by-product.

Field artillery has definite limitations. It requires time to occupy and organize a position, establish communications, obtain and compute fire data, and be ready to open fire. When artillery units occupy positions under cover of darkness it will require approximately one hour of daylight before well coordinated supporting fires can be delivered. The problem of ammunition supply is extremely important, and conditions may be present which make it difficult. Artillery requires transport, and the speed and ease of displacement is dependent upon road conditions, terrain, and weather. It is vulnerable to hostile artillery fire when its positions can be observed; it is especially vulnerable on the march. It acts by fire alone, and movement by artillery units is solely to reach positions from which more effective fire can be delivered upon appropriate targets. For these reasons it cannot act as an independent, self-sustaining arm.

Control and Adjustment of Artillery Fire. Accuracy of artillery fires is greatly increased when the area of burst is noted by an observer who communicates data so that corrections in laying of the pieces in direction and elevation may be made. The observer may be in a favorable ground location, in an observation balloon, or in an observation airplane. Communication may be by telephone, telegraph, or radio. Unobserved fire may be delivered, such as fire delivered from data computed from a map, but it is less effective and requires larger expenditures of ammunition to obtain comparable results.

Classification of Artillery by Caliber. Artillery is classified by caliber as light artillery, medium artillery, and heavy artillery. The trend in artillery development is to develop self-propelled guns and mounts.

Light artillery includes 75-mm and 105-mm weapons. 75-mm artillery is available in three types: the 75-mm pack howitzer, the 75-mm howitzer, and the 75-mm gun. The maximum effective range of this type is, in general, approximately 8000 yards for shell and somewhat less for shrapnel. The weight of the projectile is 15 lbs.

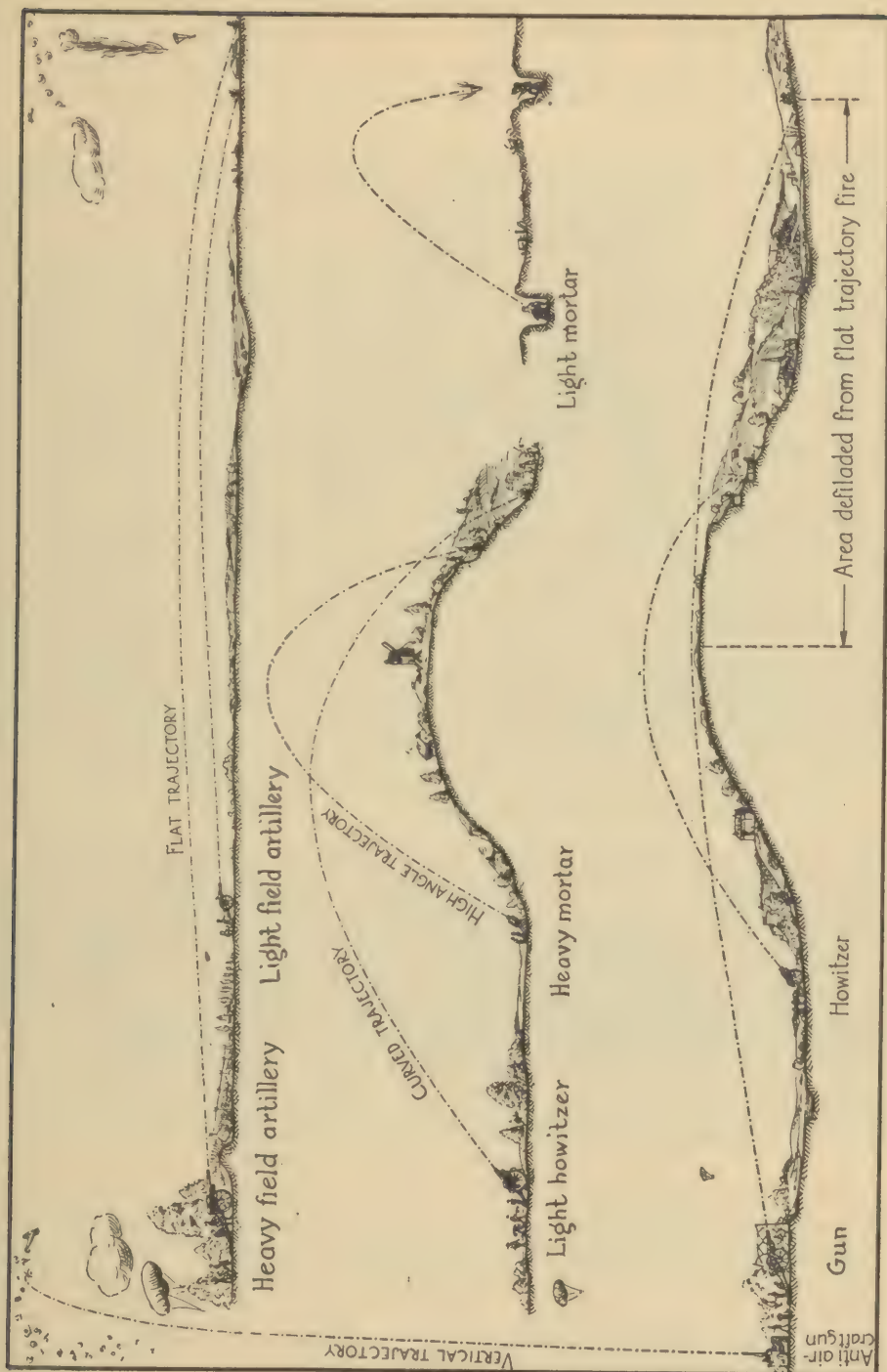


Plate 21. Trajectories of Guns, Howitzers, and Mortars.

The maximum effective range of the 105-mm howitzer is 10,500 yards with shell and 6,500 yards with shrapnel. The weight of its projectile is 33 lbs.

Light artillery may be animal-drawn or truck drawn. However, the 105-mm howitzer is entirely truck drawn.

Medium artillery includes only the 155-mm howitzer. (See Plate 23.) Its range is approximately 10,500 yards with both shell or shrapnel. The weight of its projectile is 96 lbs. It is truck-drawn.

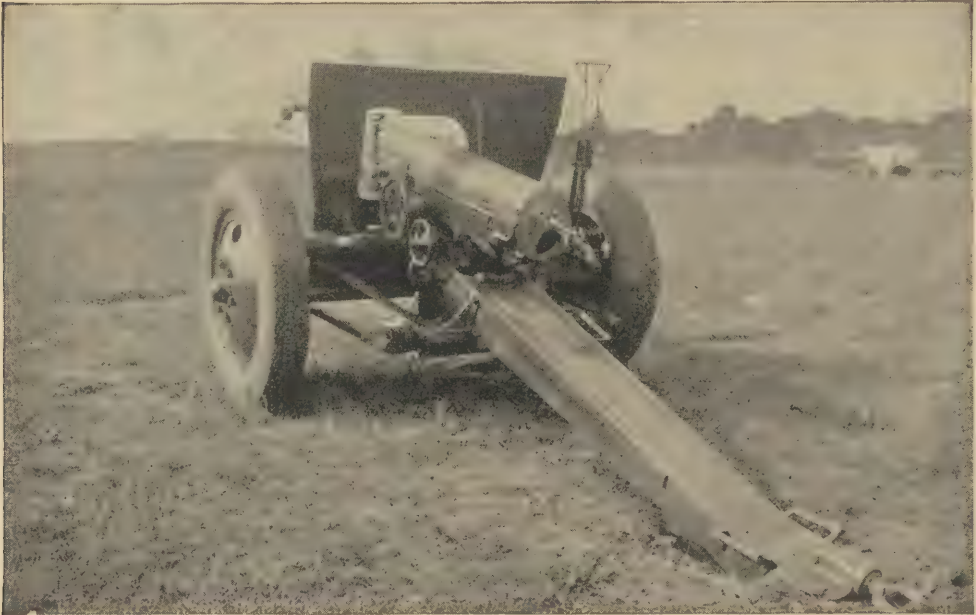


Plate 22. 75-mm Gun, Truck-Drawn Model.



Plate 23. 155-mm Howitzer, Truck-Drawn.

Heavy artillery consists of the 155-mm gun (See Plate 24) and the 240-mm howitzer. The range of the gun is 15,000-20,000 yards depending upon the type of projectile; the howitzer has a range of 14,000 yards. The weights of the projectiles are 96 lbs. and 346 lbs., respectively.

Characteristics of Artillery Ammunition. Artillery ammunition is available in shrapnel, high explosive shell, chemical shell, and smoke shell.

Shrapnel consists of a case filled with round balls, or bullets, and a fuze. The fuze may be set so that explosion occurs at the desired range from the gun. The explosion releases the bullets so that they strike the ground in the area of the target. The case and fuze are

also effective. The size of the effective area depends upon the elevation of the projectile above the ground at the time of burst, and the range—the lesser the range, the flatter the trajectory and the longer the effective area. At a range of 2000 yards the effective area is 72 yards in length. At 6000 yards it is 43 yards in length. This ammunition is used against exposed personnel.

High explosive shell may be set to burst on impact, or at a slight interval after impact to obtain the maximum effect of penetration, or to burst in the air. Its effectiveness is obtained from the shell fragments and from the force of the detonation. An air burst of 75-mm shell has an effective radius from fragments to a depth of 5 yards and a width of 30 yards, with large fragments effective to a radius of 150 yards. Medium artillery is effective to 9 yards, 40 yards, and 300 yards, respectively.



Plate 24. 155-mm Gun, Heavy Field Artillery.

Chemical shell is filled with toxic chemical agents which are liberated on impact.

Smoke shell is filled with a non-toxic chemical which develops a dense smoke cloud on impact in order to prevent hostile observation and aimed fire.

Classification of Artillery by Assignment. *Division artillery* consists of light and medium artillery. The type of division determines the size of its artillery component. The infantry or motorized division made up of three infantry regiments (the "triangular" division) has three battalions of light artillery (105-mm howitzers) and one battalion of medium artillery (155-mm howitzers). Reinforcing artillery units may be attached to divisions for tactical missions; such units are classified as division artillery while so attached.

Corps artillery includes medium artillery and heavy artillery organized as a brigade. Additional units may be attached from higher echelons. Tactically, the term *corps artillery* refers to those units, organic or attached, which are not attached or reallocated to its several divisions, hence, that which is retained directly under corps control.

Army artillery includes units which can support the army as a whole; its organizations are not fixed.

GHQ artillery in reserve includes field artillery of various categories for allocation to subordinate units in accordance with their special needs. For example, light artillery may be allotted so that a division is temporarily reinforced with one or several additional regiments from GHQ reserve.

Terms Used in Assignment of Missions. *Direct support* artillery includes those units given the mission of providing support for a designated subordinate infantry, cavalry, or armored unit. It establishes liaison and cooperates closely with the supported unit. However, it remains under centralized control in contrast to attached units described below.

General support artillery is given the mission of supporting an entire unit such as the division, rather than a single subordinate infantry unit.

Attached artillery consists of units temporarily attached to another command to serve under the orders of the commander of the unit to which attached. Illustrative of such use, a light artillery battalion may be attached to an infantry regiment on an independent mission or a mission which removes it from the proximate area of the division as a whole.

Artillery Firing Positions. Artillery units are habitually emplaced by battalion units as fire is usually controlled by battalion. The batteries of a battalion may be separated by short distances or by as much as a mile, according to the mission and terrain. Guns of a single battery will tend to be compactly placed. Battalions of artillery may be widely separated.

Battery positions should be in defilade from hostile ground observation and concealed against observation from the air by natural cover or camouflage.

In support of an attack, artillery units tend to be placed well forward with respect to the line of departure so that fire support may be continued without change of position until assault units have advanced a considerable distance. A distance of 1,500 yards in rear of the line of departure is reasonable for purposes of visualization. In support of a defense, artillery units in support of the battle position will be emplaced in rear of the regimental reserve line which itself is located in advance of the dominant observation in the locality. Units are distributed laterally so as to provide fire support to the flanks as well as to the front. Batteries of a battalion are distributed in depth so that some can fire far to the front and others can fire in support of the regimental reserve line and in front of the battle position. In this manner the enemy continues to encounter effective artillery fire after entering a position.

In the defense of a position with open flanks, some artillery may be held "in readiness." This means that it is not in firing position, but occupies a central location with respect to the battle position so that it can move quickly to engage the hostile attack from whatever direction it may come. Several positions should be selected and organized, anticipating all hostile capabilities for attack, so that prompt delivery of fire may be obtained.

Organization. The detailed organization of a field artillery regiment is subject to a considerable variation. The caliber of the weapon with which it is equipped and the composition of the division of which it forms a part are the controlling factors.

The battery of artillery is commanded by a captain and is similar to a company as a term.

The Infantry-Field Artillery Combat Team. The action of infantry and field artillery is so coordinated that the infantry and the field artillery of the infantry division function as a team. Infantry may be said to contribute the elements of maneuver, deception, and surprise. Artillery contributes the element of power, the "muscle" of attack or defense.

The effectiveness of this team is developed by the assignment of specific missions to the artillery and by close liaison between infantry and artillery commanders. The commander of the field artillery unit will maintain close touch during combat with the division commander; often his command post will be near the division command post. A light artillery battalion is often assigned the mission of providing direct support of an infantry regiment. When this is the case the artillery commander will maintain close touch with the infantry regimental commander. Each artillery battalion has personnel to furnish liaison detachments to accompany the troops supported. It is desirable that such a detachment accompany each assault battalion in attack, and during the defense each battalion on the main line of resistance. These detachments include an officer, the necessary enlisted personnel, and communication facilities. The officer advises the infantry battalion commander as to ways in which the artillery may be used to advantage, transmits requests for fire with the location of the targets, and may observe the fire in order to send back information to increase its accuracy and effectiveness. By these means joint action is

obtained. The flexibility of artillery fires, and the ease with which it may be shifted in elevation and direction permit it to assist adjacent units which may have a temporary need for greater fire support.

Medium artillery may likewise be assigned missions in direct support, but it is more usual for it to be held in general support of all units in the division area. When so used it may support light artillery regiments, adding to the density of those fires, or engage targets beyond the range and powers of light artillery. The distinction is that it will receive requests for fire from the light artillery regiments rather than from supported infantry units. It will also engage targets which are discovered by observers in observation balloons, observation airplanes, as directed by the division commander, or other sources.

The problem of developing effective, closely-knit infantry-artillery teams is of the greatest importance. Upon its successful accomplishment may hinge success in battle.

ENGINEERS

Purpose of the Engineer Component of Large Forces. A large field force finds constant need for units trained and equipped to execute construction and maintenance missions. The Corps of Engineers is charged with the execution of these tasks. It will be charged with the maintenance of existing facilities needed by the force, particularly those which lie within the theater of operations. It will be called upon to build entirely new installations which are required, particularly of lines of communications. It must be able to perform all of the special engineering tasks required in battle or campaign by large forces such as infantry divisions, cavalry divisions, corps, and armies.

The diversity of tasks requires that engineer units be trained and equipped to accomplish each of these special purposes. *General engineer units* are able to undertake a wide variety of construction tasks. *Combat engineer* battalions or regiments are included within this classification. *Special engineer units* are trained and equipped for the execution of tasks within a restricted technical field.

Combat engineers of infantry or cavalry divisions participate in battle. The execution of assigned missions may include contact with the enemy as, for example, in the execution of demolitions to impede a hostile advance. They may be used at a critical stage in combat, and their orders will frequently include a requirement that they be prepared to assemble at a prescribed area within a definite time limit. They are trained to operate as infantry, particularly as infantry rifle companies.

Specific Missions of Combat Engineers. Combat engineers are able to facilitate the advance of friendly troops. This requires the maintenance and repair of roads and rail lines within the division or corps area. This is often a difficult task because of the heavy overload which these facilities may be called upon to bear. It will include the repair of bridges and culverts which may have been damaged by the enemy. Motorized and armored units are especially dependent upon engineer units for work of this nature during an advance in hostile territory.

In addition to facilitating the advance of friendly troops, engineer units impede a hostile advance. This includes such tasks as demolition of bridges, roads, railway facilities, the construction of obstacles such as road blocks, tank barriers, mine fields, and barbed wire entanglements. It includes the marking out of defensive positions under some situations and may include phases of such construction.

They provide for the shelter and comfort of friendly troops by providing for the supply of water, the operation of utilities within the theater of operations, and construction or improvement of facilities necessary for the health and welfare of troops.

Map reproduction is an important function of combat engineers so that an adequate supply of maps may be available. This work must be done rapidly and accurately by methods appropriate to service in the field.

The organization of a position requires the use of large numbers of tools, picks and shovels particularly, which are not included in the equipment of infantry units. The division engineer unit would then distribute these tools from its own supplies and, if these were insufficient in number, would secure additional quantities from engineer depots.

Units within the division have need of engineer support in the execution of their routine

tasks. The quartermaster may need improvement of an area at the railhead to permit a large number of trucks to load or unload simultaneously. Improvement of an area about an ammunition refilling point may be necessary. Rains may make an important road impassable at some points. The division surgeon may need assistance from the engineers in the vicinity of the hospital station. The air officer may require construction or improvement of an advanced landing field. Water for men and animals may have to be pumped, made potable for drinking, transported, and distributed. There are many other tasks similar in nature. Their nature indicates the importance of the missions which are regularly performed by engineer units.

A cursory examination of terrain structure indicates the importance of rivers in military operations. Destruction of bridges by a retreating enemy creates a difficult obstacle. River crossing operations are common, and their execution difficult. Engineer units equipped with pontons and assault boats are equipped and trained for these missions.

Organization and Equipment of Combat Engineers. A company of combat engineers consists of a company headquarters and two platoons. Each platoon has a platoon headquarters, an operating section, and a tool section. The division engineer battalion has three such companies.

SIGNAL CORPS

Mission. The signal corps operates the message center and installs and operates the communication facilities for the headquarters of divisions and higher echelons. The communication means include wire circuits and radio nets, the wire being used for telegraph, teletype, and telephone. The maintenance of these facilities under the conditions imposed by combat is included in the mission.

The extent to which communication facilities are maintained by a unit having signal corps personnel, such as the infantry division, is as follows:

To, but not including, the headquarters or command posts of the next subordinate unit and to the attached units. This would require the division signal company to install communication facilities to the headquarters of the infantry regiments and to the division artillery battalions; to the headquarters of the engineer battalion; to the unit in division reserve; to the clearing station; to the headquarters of attached units such as antiaircraft artillery, chemical units, or units of the Air Forces.

To the headquarters of the corresponding unit on its left, unless higher authority prescribes otherwise, in order that lateral communications facilities may be available.

Organization. The signal company, infantry division, consists of a headquarters platoon, an operating platoon, and a construction platoon.

The operating platoon has a message center section which establishes and operates the message center at division headquarters or at the division command post, a radio section, and a telegraph and telephone section.

The construction platoon is provided for the installation of wire communications.

Subordinate units of the division are provided with personnel to perform the same missions under identical principles. The difference lies in the fact that the personnel is not furnished by the signal corps, but is a part of the organic strength of the units concerned. The Signal Corps, however, exercises technical control over the various signal agencies of a command.

Responsibility of the Commander. Communication facilities provide the necessary channels through which a commander receives information and directs the action of his troops. Although the tempo of modern combat has in no sense reduced the necessity for a commander to visit his troops, confer with subordinate commanders, and observe in person the execution of assigned missions, the very size and scope of operations place an increasing burden on these facilities. Reliable and continuous communications are vital to success in battle. Since communications are an important agency of command, it follows that a commander is responsible for their efficient operation. The signal corps unit or communications personnel of a command is merely the agency which executes the will of the commander in supplying this need.



Plate 25. An Infantry Regimental Command Post.

The commander of each unit exercises supervision over the signal systems of subordinate units in the same manner as for all other functions. This supervision may be exercised by the signal officer, upon the approval of the commander, through the normal channels of command. Technical control and coordination is usually exercised directly between the signal officers concerned.

The Message Center. A *command post*, which includes a message center, is defined as a control locality at which the tactical staff does its works and through which the commander may be reached. A *message center* is a signal agency established at a headquarters or command post which is charged with the receipt, transmission, and delivery of all messages except those handled by the postal service or those messages transmitted from the originator or addressee by telephone or personal agency. It operates under the unit signal or communication officer. The message center moves with its headquarters.

An *advance message center* may be established at an advanced location for the convenience of the commander and staff when operating well forward of the message center.

Installation, operation, and maintenance. The installation, operation, and maintenance of communication facilities is included within the mission of signal or communication agencies. Under the conditions of battle this is often a difficult operation, especially when movement is rapid. It is a principle that communication must be continuous, regardless of the rapidity of movement during the conduct of operations.

Axis of Signal Communication. During combat, when the movement of a command post to successive locations is contemplated, as in an attack, successive locations of the command post are announced in the direction of movement. This is called the axis of signal communication. This practice facilitates the coordination of communication agencies and assists in their ready location as the action proceeds.

Messengers and Messenger Service. The requirements for communication in combat lead to the use of all types of messengers, such as: runners (foot messengers), horse messengers, motorcycle messengers, motor messengers, using combat vehicles, airplane messengers, bicycle messengers, and homing pigeons.

A *scheduled messenger service* is maintained between units or establishments whenever such service will reduce the personnel required without seriously delaying transmission. This class of service is usually operated on a time schedule.

Visual Signals. While the introduction of radio and wire communications has reduced the need for communication by visual means, messages may be transmitted by signal lamps, pyrotechnics, flags, and panels. Pyrotechnics are used from the air and from the ground to send short, prearranged messages such as a call for artillery fire. Panels are used to signal from the ground to aircraft for such purposes as marking the position of assault units or identifying a unit in a locality.

Communication Facilities of a Medical Unit. Except in units provided with radio, communication is maintained by transmission of messages by vehicles in the execution of other missions, by messengers, or by utilizing the communication facilities of the most convenient unit of the force supported. The clearing station will often be provided with telephone communication by the division signal officer.

Definition and Classification of Messages. The term "message," as used herein, includes all instructions, reports, orders, dispatches, and documents of whatever nature whether in secret or in clear text, and also all photographs, maps, overlays, or sketches transmitted by field agencies of signal communication, as distinguished from those transmitted by mail or commercial agencies. (A telephone *conversation* between two persons over a field wire system is not classed as a "message"). Certain messages, because of their importance, should be given priority over others in transmission. For this reason messages are divided into the following classification: *urgent*, *priority*, and *routine*. Messages are considered routine by transmitting agencies unless the writer specifically classifies them as urgent or priority by writing the appropriate word on the face of the message. The urgent classification is reserved for those messages that require the greatest speed in handling. When so marked, the message will be sent immediately upon receipt by the transmitting agency

unless another urgent message is being sent. Priority messages are given precedence over all routine messages waiting to be sent. Commanders should resort to the preferred message only in cases of actual necessity, as indiscriminate use of this device decreases its effectiveness. No greater priority should be demanded for a message than its relative importance warrants.

Preparation of Field Messages. The transmission of field messages is facilitated by a uniform arrangement of their contents. Irregularity in the address or authorization delays transmission and increases the chance of error. *The inclusion of the correct date and hour of origin of the message is essential* to proper evaluation by its recipient. Serial numbers on the messages aid in control of traffic. Therefore, special forms for field messages are prepared, bound in books, and issued to the service. These forms have definite places for all the items mentioned above, a space for the text or body of the message, and spaces for the use of transmitting agencies.

In writing field messages be brief, concise, but above all legible and accurate. Adopt a telegraphic style as if each word were being charged for at commercial rates but do not omit anything which is essential to a full and complete understanding of the message by the recipient. Use only the authorized and generally understood abbreviations. Be careful of such words as "right" and "left" when compass directions as "east," "west," "north," or "south" are more specific. When a message is written, read it from the viewpoint of the person to whom it is to be delivered, assuming that he has normal intelligence, in all probability a compass, but no "Ouija Board." If it still makes sense and tells the complete story, it is ready for transmission.

THESE SPACES FOR MESSAGE CENTER ONLY		
TIME FILED (1)	MSG CEN NO (1)	HOW SENT (1)
(2)	MESSAGE (3)	
(4) No <u>8</u>	DATE <u>23 July 40</u> (5)	
(6) To <u>CO 1st Inf</u>		
<u>Your regiment moves by truck to</u> (7) <u>BROWNS MILLS at 3:00 AM 25 July.</u> <u>Trucks report for loading at</u> <u>CR 493A at 12:00 midnight. Orders</u> <u>later for employment of 1st Inf</u> <u>upon arrival destination.</u>		
(8) <u>CG 1st Div</u>	6:00 PM (9)	
OFFICIAL DESIGNATION OF SENDER		TIME SIGNED
(10) <u>Joe Wilson Maj S-3</u>		
SIGNATURE AND GRADE OF WRITER		

Plate 26. Form M-105 Message Blank Correctly Filled Out.
The full size of the message sheet is 5½ x 4¼ inches.

The Field Message Book. The field message book, Type M-105, is the most recently adopted message book for general use, and is the type carried by infantry officers, noncommissioned officers, and any other personnel who have occasion to write field messages. The book is designed to fit the shirt pocket. Each message sheet in the book has a carbon back, except the tissue sheets intended for the writing of messages to be sent by pigeon. In addition there are vellum sheets for sketches or overlays.

To prepare the book for the writing of a normal message, the cardboard stop is inserted between the third and fourth unused message sheets, in order to block off the remaining message sheets. One writing thus makes an original and two copies of the message. The second copy is retained in the book for the writer's file or reference. The original and the first copy are dispatched to the message center, the original for transmission and the first copy for temporary file at the message center. At the proper time, the staff officer charged with the preparation of the unit journal should incorporate the temporary file copy in the journal.

Plate 26 shows a message blank correctly filled out by the writer. The numbers in parenthesis refer to the following notes:

- (1) Not to be used by the writer.
- (2) The writer may enter here a preferred classification, such as urgent or priority.
- (3) The writer ordinarily does *not* indicate the agency of transmission. If he desires physical transmission, he should enter here: "by Msgr."
- (4) The *writer's* own message number. Message numbers run serially through the 24 hour day. The first message written after 12:00 midnight is always No. 1.
- (5) The date is always written in the order: day, month, year.
- (6) Insert the *official designation* of the person addressed, not "Colonel X. Y. Jones." Col. Jones may have become a casualty, but there is always an incumbent commanding officer of the 1st Infantry. Add the actual location only when necessary to insure delivery. Do not use telephone code names as an address.

(7) *Write plainly*, using a pencil that will make clean-cut carbon copies. Print proper names (except signature and grade of writer) and code or cipher groups in CAP-ITALS. Poor writers should print the entire message.

(8) This is the official designation of the authority for the message.

(9) The time signed is often as important as the date. It may be written as shown, or simply as "6:00P," omitting the "M." "12:00 AM" and "12:00 PM" are confusing. It is better to write "12:00 Midnight" or "12:00 Noon." The 24-hour clock system may be used as a means of eliminating confusion between AM and PM.

(10) This is either the signature of the sender of the message or the person authorized to write the message for him. Thus, in the example given, Major Joe Wilson is authorized, as a staff officer, to write messages for the Commanding General, 1st Division.

Before Major Joe Wilson turns the above message over for transmission he *reads it carefully*, remembering that "If a message *can* be misunderstood it *will* be misunderstood."

COAST ARTILLERY CORPS

Mission. The *Coast Artillery Corps* is characterized by the great fire power it can deliver primarily against naval and aerial targets. Its armament comprises seacoast artillery, antiaircraft artillery, and submarine mines.

The missions of the Coast Artillery Corps are to attack enemy naval vessels by means of artillery fire and submarine mines, and to combat hostile aircraft by means of fire from the ground.

Cooperating in coastal frontier defense with the Navy off shore, the Coast Artillery Corps mans and serves the harbor defenses established in time of peace and augmented in time of war. These harbor defenses are highly organized and strongly protected localities, organized administratively and tactically for the defense of a harbor or other water area.

Seacoast Artillery. *Seacoast artillery* comprises all the artillery, whether fixed or mobile, employed against hostile naval vessels. It is classified according to caliber as primary armament which includes cannon of 12-inch or greater caliber, and secondary which includes all other armament.

Seacoast artillery has the same general characteristics of fire as Field Artillery except for its greater power and range, and the armor-piercing ability of its projectiles which, in general, are not suitable for use against land targets. It is provided with special equipment to facilitate the delivery of accurate fire on moving targets at sea.

Fixed seacoast artillery secures protection from naval and air attack by fortifications and other permanent structures; its operation and service are greatly facilitated by mechanical means; its stability permits great accuracy of fire. The provision of per-

manently installed communications, stations and fire control equipment makes possible the establishment of a common fire direction to exploit the flexibility of artillery fire to the maximum extent.

Mobile seacoast artillery comprises *railway* artillery and *tractor-drawn* artillery. Both types combine strategical mobility with a limited tactical mobility and require a considerable time for emplacement. Mobile seacoast artillery provides additional gun fire for existing harbor defenses and is used in conjunction with other forces to protect harbors or coastal areas for which no permanent defenses have been provided.



Photo by U. S. Army Signal Corps.

Plate 27. Coast Artillery 16-Inch Harbor Defense Gun.

Seacoast artillery is organized into groups and groupments in order to develop the maximum fire power and provide efficient fire direction.

Antiaircraft Artillery. The mission of the *antiaircraft artillery* is to combat hostile aircraft. For this purpose, it is equipped with antiaircraft guns, machine guns, searchlights, sound-locators, and equipment required for observation, fire-control, and signal communication. These means of antiaircraft defense are combined in the regiment.

Antiaircraft artillery operates both by day and by night. Because of the mobility of its matériel, antiaircraft artillery lends itself to rapid concentration in critical areas.

Antiaircraft artillery reinforces the antiaircraft measures of other troops and, in co-operation with our own aviation, operates especially against hostile aircraft flying beyond the range of the weapons of other troops. It provides protection for those vital elements of a command most likely to be subjected to hostile air observation or attack. It is employed also in harbor defenses and for the protection of airdromes and other sensitive points in the rear areas.

The establishment of a coordinated antiaircraft defense is facilitated by *centralized*



Plate 28. 3-Inch Coast Artillery Antiaircraft Gun.

control of antiaircraft units. In some situations, however, such as during an advance, it may be necessary to decentralize control of part of the antiaircraft artillery to protect widely separated units or installations.

An essential agency of antiaircraft artillery is its *intelligence service*. This service gathers and transmits information of the enemy's air activities necessary for the proper employment of the antiaircraft artillery units. It should not be confused with the *aircraft warning service* which is a regional service forming part of a theater, sector, or area, and serving all agencies of antiaircraft defense. The aircraft warning service operates directly under the control of the commander of a sector or area or the theater of operations concerned.



Plate 29. 37-mm Coast Artillery Anti-aircraft Gun.

Materiel. The weapons used by antiaircraft artillery consist of the antiaircraft artillery gun, 3 inches or larger in caliber, which is provided for attack of high-flying aviation, the 37-mm antiaircraft gun, and the caliber .50 machine gun.

The 3-inch antiaircraft guns fire a 12.7-pound projectile to a vertical range of 9,700 yards and a horizontal range of about 14,200 yards. Rate of fire is 25 shots per gun per minute. The total weight of the piece and its carriage is approximately 8 tons.

The 37-mm antiaircraft gun is a highly mobile antiaircraft gun capable of full automatic fire at a rate of 120 shots a minute. Its range is approximately 2,500 yards. Total weight of gun and carriage is $2\frac{1}{2}$ tons.

The caliber .50 machine gun has an effective range of 1760 yards and delivers fire at a rate of 250 shots per minute.

Detection of approaching aircraft, obtaining and computing firing data in time to be of use, and transport of the weapons and equipment requires the following rather elaborate and costly equipment: searchlights, sound locators, stereoscopic height finders, data computers, fuze setters, and fire directors.

Organization. The antiaircraft artillery regiment consists of the following units:

Regimental headquarters.

Headquarters battery.

Gun battalion consisting of battalion headquarters, headquarters battery, and ammunition train; searchlight battery with five platoons, each operating one searchlight and one sound locator; and three gun batteries, each operating four mobile antiaircraft guns and four caliber .50 antiaircraft machine guns, the latter for protection of the battery from attack by hostile low-flying airplanes.

Automatic weapons battalion consisting of battalion headquarters, headquarters battery, and combat train; one machine-gun battery of three platoons, each operating four caliber .50 machine guns; and three 37-mm gun batteries of four platoons each, each operating two guns.

The regiment may be formed into provisional battalions, constituted as may be appropriate to the mission, for temporary attachment or support of other arms, when less than the entire regiment is required by the mission or available for employment.

ARMY AIR FORCES

Mission. The general mission of the *Army Air Forces* is the preparation for and execution of air operations as a part of the field forces.



Photo by U. S. Army Signal Corps.

Plate 30. Caliber .50 Antiaircraft Machine Gun.

Characteristics. Military aviation is characterized by an extremely high degree of mobility, the ability to move in three dimensions, and extreme range of fire power. Air operations may be restricted by hostile counter air force operations and antiaircraft measures, by the availability of air bases, and by adverse weather conditions.

The mobility of aircraft enables them to cover great distances in a short period of time and makes possible their rapid intervention at critical points in a theater of operations and rapid movement between widely separated theaters.

The power of aircraft to move in any direction enables them to maneuver in altitudes beyond the range of ground weapons, to approach terrestrial objectives from such altitudes, and to make deep incursions into enemy territory.

The operating range and fire power of combat aircraft are reciprocal functions and depend upon the distribution of the useful load between fuel and ammunition.

Types of Air Operations. In general, air operations involve three fundamental tactical functions:

Air attack, which is the attack of objectives on the earth's surface by aircraft;

Air fighting, which is the act of fighting between aircraft in flight;

Air reconnaissance and observation, which is the gaining of information through visual and photographic means carried in aircraft.

Types of Aircraft. In accordance with the purpose for which aircraft are ordinarily employed, military aviation is divided as follows: combat; reconnaissance, observation, and liaison; transport; and training and special purpose aviation.

Combat aviation is organized, equipped, and trained to engage in offensive and defensive air operations by air attack and air fighting. Corresponding to the means with which equipped, combat aviation is organized into bombardment and pursuit units. Medium and long-range reconnaissance is performed by bombardment types of aircraft.



Official Photograph, U. S. Army Air Corps.

Plate 31. North American O-47A Observation Airplane.

Reconnaissance, observation, and liaison aviation is organized, equipped, and trained to conduct air reconnaissance, observe fire, gain military information by visual and photographic means, and transmit instructions and reports in accordance with the orders of supported units to which organically assigned or attached. It includes both heavier-than-air aircraft and balloons. Although armed for their own protection, they are not suitable for air attack or air fighting.

Transport aviation is organized, equipped, and trained to carry personnel and cargo. It is indispensable for facilitating the operations of Air Corps units through the rapid transport of personnel and essential items of supply, and is particularly suitable for increasing the mobility of foot troops in an emergency.

Training and special purpose aviation is organized, equipped, and trained especially for the training of flying personnel and for other special purposes not connected with air operations; it is neither suited nor intended for combat use.

Powers and Limitations. A knowledge of the powers and limitations of *combat aviation* is a prerequisite to sound employment. These powers and limitations are derived from the characteristics of its constituent aircraft. These characteristics change rapidly with the development of new aircraft.

Bombardment aviation is characterized by its ability to carry large loads of destructive agents to attack surface objectives. It includes light, medium, and heavy bombardment.

Light bombardment aviation constitutes the principal element which operates in

direct support of ground forces. Its principal weapons are light bombs and chemicals. It is capable of applying these destructive agents to destroy light material objectives, to interdict routes of communication and supply, to render airdromes temporarily useless, and to attack troops in the open or under light shelter.

Medium and heavy bombardment aviation constitute the offensive power of air striking forces. They are designed to carry the maximum bomb loads to great distances and to conduct long-range strategic reconnaissance over land and sea. Their principal weapon is the heavy bomb. They rely primarily upon high altitude flying speed, defensive fire power, darkness, and the cover of clouds for security. They are particularly suitable for the destruction of heavy material objectives. Their radius of action is such that they can strike objectives at a great distance from their base and still find service and security deep in friendly territory.



Official Photograph, U. S. Army Air Corps.

Plate 32. Bombardment Airplane, Boeing B-17B, the "Flying Fortress."

Pursuit aviation is characterized by its great speed and maneuverability in the air and by its ability to engage in air fighting. It includes interceptor and fighter pursuit.

Interceptor pursuit aviation is designed primarily for defensive missions in the anti-aircraft security of important areas and ground installations, and the protection of ground troops and their observation aviation. It extends protection beyond the range of anti-aircraft artillery and its operations are coordinated therewith.

Fighter pursuit aviation has greater range than interceptor pursuit and is designed to accompany and protect bombardment aviation exposed to attack by hostile combat aviation.

Although pursuit aviation is designed primarily for air fighting, it can also be used to attack troops and their transportation.

Balloons constitute elevated observation posts and serve as a means for extending the field of view under continuous observation. They possess a considerable degree of mobility and can be moved frequently without material loss of efficiency. They are, however, vulnerable to attack by hostile combat aviation and anti-aircraft artillery if within range of the latter.

For purposes of observing and adjusting artillery fire, the balloon or the observation airplane is employed, whenever practicable, in preference to the reconnaissance airplane which is provided for and intended to perform reconnaissance missions.

Fire Power. The *fire power* of combat aircraft used in air attack is characterized by its potential concentration and cumulative effect. This effect depends upon the nature and extent of the objective, upon the enemy's measures for anti-aircraft defense,

and upon the number and characteristics of combat aircraft used against the objective. The constant threat of air attack exerts a strong influence on surface movements and operations.

Air Fighting. Because of the speed and powers of evasion inherent in all aircraft, *air fighting* is generally of a brief duration and the results are often indecisive. As a result, pursuit aviation is incapable of controlling the air in the same sense that surface forces can control an area. Air fighting will, therefore, be carried on as necessary to limit hostile air operations.



Official Photograph, U. S. Army Air Corps.

Plate 33. Bell XFM-1 Pursuit Airplane (Multiplace).

Air Reconnaissance. *Air reconnaissance* and *observation operations* are characterized by wide range and great depth, by the excellence and precision of the air photographs taken, and by the rapidity with which information is obtained and transmitted. They are limited by poor visibility, bad weather, antiaircraft fire, and the opposition of hostile combat aviation.

All aircraft except balloons are equipped with two-way radio; balloons are able to communicate by telephone with the ground. Other means of communication between air and ground are dropped and picked-up messages, pyrotechnics, flares, and other visual signals.

Care and Maintenance. Much of the equipment pertaining to aircraft is of a complex and highly technical nature; its operation requires highly trained combat crews; its maintenance and repair require mechanics with specialized skill. As a consequence, all aircraft need constant care and maintenance and are vulnerable to air attack both in flight and on the ground. The fatigue of combat crews and the repair and servicing of equipment and matériel require all aviation units to operate from air bases where the necessary facilities are provided for rest, replacement, maintenance, and repair.

The frequency of engagements of the elements of an aviation unit depends upon the urgency of the situation and the demands already made on the particular unit. It is essential that aviation units be conserved in their employment during less active periods of operations so that crews and equipment may be pushed to the limit of endurance during critical phases of operations.

Air Bases. Air bases, suitably located, are essential for the operations of combat aviation. Without a suitable air base from which to operate, combat aviation soon becomes impotent.

An *air base* is an Air Forces command which comprises the landing facilities and the installations for shelter, supply, maintenance, and repair that are necessary to sustain the operations of combat aviation. Such a base will, as a rule, cover a considerable area. Its security requires a wide distribution of base facilities and installations and adequate means for their protection.

Organization. The basic administrative and tactical unit of the Air Forces is the squadron. The group, composed of two or more squadrons, is the principal tactical unit and contains all the essential elements necessary for operation, maneuver, and combat. The next higher Air Forces unit is the wing which may consist of two or more types of aviation but will rarely, if ever, operate tactically as a unit in the air.

GHQ Aviation. GHQ aviation, under command of the Commanding General, Army Air Forces, comprises:

Striking forces which operate as strong offensive air units to extend air operations to a great distance from their operating bases.

Defense forces which provide the necessary antiaircraft defense of the most vulnerable and important areas of the zone of the interior.

Support forces which operate in direct support of the operations of the ground troops.

Special forces which meet the requirements for air operations in coastal defense and similar operations in minor theaters.

The *aviation* assigned to an *oversea department* conducts whatever air operations may be required incident to the application of the defense plans of the particular oversea department.

Aviation Component of Large Units. The *aviation* organically assigned to *large units* is generally limited to reconnaissance, observation, and liaison types, suitable in range and speed to the missions to be executed. The organization of these Air Force units is determined on the basis of the estimated minimum requirements in aviation of the several large units. When greater strength in aviation is required for any particular operation, the increase is provided by attaching additional units. A portion of GHQ aviation may be attached to or placed in support of larger units, the size and composition of such support forces depending upon the task or mission to be executed.

The *aviation* assigned to the *zone of the interior* comprises training and special purpose aviation and such other Air Force units and establishments as are required for effective mobilization and training, and for replacement and maintenance of aviation in the theatre of operations. A portion of GHQ aviation (defense forces) may be assigned for antiaircraft defense in the zone of the interior.

Battle Employment. The organization for combat of the aviation of a command is a function of the commander; each chief of aviation (air officer in the field army) acts as adviser to his commander in the performance of this duty. This organization for combat is based on the consideration of the characteristics and the amount of aviation available, and a study of the air operations to be conducted in accordance with the situation. The organization should be such as to constitute a suitable task force to accomplish the mission, and render command, tactical control, communication, and supply most effective.

The selection of objectives against which air operations are to be directed is of vital importance. Air operations must be pushed with energy and dispatch, using every opportunity to take full advantage of surprise. Since the replacement of flying personnel and equipment is both slow and expensive, economy of force is especially important. Combat aviation should be employed in mass against objectives of decisive importance for the accomplishment of the mission of the field forces, and not dispersed or dissipated in operations of minor or secondary importance.

Air operations beyond the sphere of action of the ground forces are undertaken in

furtherance of the strategical plan of the commander of the field forces. These operations are discussed in FM 100-15.

Combat aviation placed in support of large units operates to further the mission of the supported command. The superior commander under whom such support aviation is operating is responsible for the assignment of air missions or objectives, and for its employment within or beyond the sphere of action of ground forces.

In general, the greatest effectiveness of military aviation is secured through centralized control. When decentralization of support aviation becomes necessary in situations requiring immediate tactical support of specified units, the superior commander attaches to or places a part or all of his support aviation in support of a specified large unit so that it may act with greater promptness and better understanding in meeting the requirements of the supported unit.

In the hands of higher commanders, *support aviation* constitutes a powerful means for influencing the course of combat after the ground forces have become engaged. The increased application of motorization and mechanization extends the possibilities for air attack. The difficulty of gaining fire superiority over a well-organized defense points to an increasing need of air attack in support of ground troops, especially in critical situations when the available means of support on the ground are inadequate.

The hostile rear area is the normal zone of action of support aviation since operations in this area permit the full utilization of striking power against concentrated targets with the minimum losses and the maximum results. Ordinarily the most effective results will be obtained from bombing attacks launched at altitudes above the effective range of ground weapons. Support aviation usually is not employed against objectives which can be effectively engaged by available ground weapons within the time required.

THE ARMORED FORCE

Introduction. The Armored Force has taken on the characteristics of a separate arm. Since it contains within its structure elements of other separate arms and services it may also be likened in this respect to the Army Air Forces. With tank regiments forming the keystone of its power, the armored division is a versatile large organization capable of operating at great speed over long distances always retaining the capacity to deliver a strong blow in the accomplishment of important missions. The warfare of today places ever-increasing emphasis upon the importance of armored power and air power. It is a form of warfare in which the United States may expect with reason to excel. We have the manufacturing resources. We have the raw materials. Our people are motor-minded, tank minded, and airplane minded. The swift increase in the number of armored divisions and the certainty that more will follow should enable even the blind to see that the United States will make its weight felt in due time. There are major problems to be solved, especially in the field of transportation. Each development in warfare is dependent for success upon many factors. The Armored Force will contribute its full share to the victory which somehow and sometime we have resolved to fashion.

Elements of Armored Force Organization. The armored division may be visualized as the basic large unit of the Armored Force. It consists of the following essential elements: *The command element, reconnaissance element, striking element, support element, and service element.*

The commander and his staff comprise the command element. The general officer commanding an armored division has the same responsibilities as the commanders of other types of large forces. His staff is organized along conventional functional lines consisting of a general staff and a special staff.

The reconnaissance element is furnished to provide the information the commander requires in order that he may lead and control the division with adequate knowledge of obstacles to be encountered or avoided, and opportunities he may exploit. He must rely upon much information gained from reports from air support units in support of his division. From organic reconnaissance units he must obtain detailed information

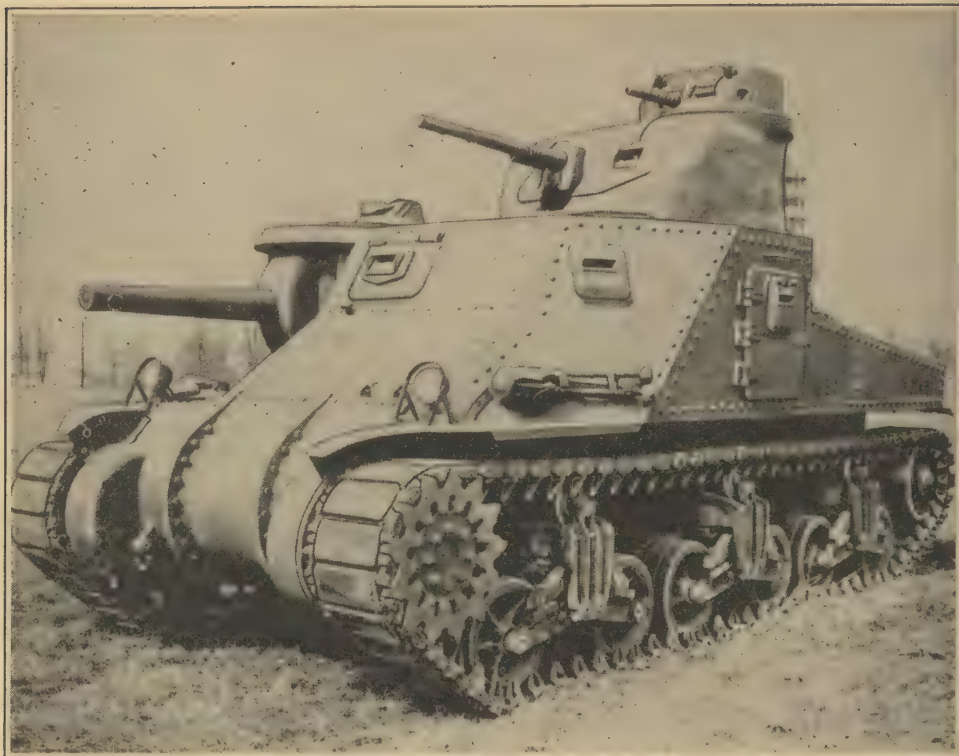


Plate 34. A Medium Tank.



Plate 35. Scout Car Emerging from Woods.

from ground observation far to the front, flanks, or rear as the situation requires. Since an armored division may operate independently at considerable distance from other troops, surprise action by an enemy may result in capture or destruction. Adequate reconnaissance is the means to prevent such unhappy results. A study of the action in North Africa indicates the constant need for accurate information as well as the disaster resulting from its lack.

The striking element includes the armored regiments which are equipped with tanks. All action of an armored division may be said to have for its purpose the placing of the striking element in position to deliver the final, crushing blow. It is obvious that the reconnaissance element must gain the information to permit the tanks to be placed at the right place and time to accomplish the assigned mission.

The support element is provided to assist the armored regiment with their tank units. It comprises infantry, field artillery, and combat engineers.

The service element enables the division to sustain itself in action. It consists of elements for supply, evacuation, repair and salvage.

Characteristics of Armored Units. Armored units have capabilities and limitations which bear directly upon their strengths and their weaknesses. Each type of vehicle relies upon its capacity for swift movement over varied terrain. Each type of vehicle encounters conditions it can overcome superbly; those which it can do fairly well; and others it should not be called upon to execute. It is a law of physics that for each action there is an equal and opposite reaction. Accordingly, if an undue emphasis is placed upon mere speed of movement there must be a reduction in weight. This will be reflected in less armor for the protection of crews, reduced gun power, and greater fragility throughout. On the other hand, if safety of crews and great gun power is overemphasized, speed must be reduced and swifter vehicles will have their more sluggish adversaries at their mercy. Hence, design of each type of vehicle may be said to constitute a series of compromises. Whether there can ever be a "best" tank in the possession of any world power is open to argument in the minds of many students of the question. There is always the possibility that some genius in design, or metallurgy, or manufacturing may fashion a model which will be superior in several of the essential traits. The nation which can produce this genius, and produce his machines in quantity, either of the ground or air, may have won its war.

The capabilities of the tank, or things it can do well, are the following: A sufficiently high road speed enabling the unit to move over great distances in relatively short time. It can move across country at speeds depending entirely upon the terrain encountered. Generally the cross country speed will approximate 50% of the road speed of the same vehicle although this rule of thumb is open to the widest variation since some movements off roads may be accomplished at road speed while others may traverse only at minimum speed because of obstacles or terrain conditions. The tank is able to cross small obstacles, ditches, and shallow streams. More serious obstacles require the assistance of combat engineers or special equipment. Thin woods and brush are readily negotiated. The tank has great fire power. In fact, the tank may be regarded as a movable gun platform with armor protection for the crew while it moves to positions from which to fire or fires while in movement. Because of its weight and speed, the tank has crushing ability to overrun enemy personnel, and to destroy hostile guns and equipment. Armor protection for the crews enables tanks to operate within the zone of hostile small arms fire as well as under hostile fire of any kind which has not sufficient power to disable the tank.

While the above favorable characteristics are of the utmost importance, there are limitations or less favorable capabilities which must be understood. It is true of all tools of war. Defense against any device consists of seeking to avoid its strong points and exploitation of its weaknesses. The tank unaided cannot cross deep streams, soft-bottomed streams, marshy ground, or swamps. Some ground which can be easily crossed in dry weather becomes impassable for tanks after heavy rains. They cannot cross wide ditches or other large obstacles unaided. Dense woods with heavy timber should be avoided. Bridges and culverts of light construction such as are encountered

on all but our best-constructed highways may be impassable. Operations in mountains must tend to follow the road net. Tanks are noisy and their operations difficult to conceal. Antitank guns and artillery are effective against tanks. The student should observe with interest the constant race between the power of antitank guns and the development of armor to resist them. Fire from moving vehicles has sharp limitations, especially because of the limited vision of gunners in moving tanks with ports and doors closed. Tanks are helpless without an adequate fuel, lubricant, and ammunition supply. True or false, the Germans have claimed the capture of a French armored division because its fuel tanks were dry and its ammunition expended. Tanks require periodic maintenance. It is true that these are important handicaps. Skill in leadership, in training, in reconnaissance, in repair and maintenance, ingenuity and foresight on the field of battle reduce the importance of the limitations and increase the accomplishments to be expected from the powers of tanks. The famous wrestling coach at West Point who coined the expression, "There ain't no holt that can't be broke" fathered a philosophy which our new army could well adopt.

Missions for Armored Forces. Armored forces can perform missions as varied as other ground components. They cover the field of offensive combat, defensive combat, and special operations.

Since the armored division is organized and equipped for great speed in operations, it follows that its primary role is in offensive operations against hostile rear areas. In mobile warfare where the nature of the terrain is favorable, the speed and deftness with which an armored division is able to operate gives it a position of dominance. Bold maneuvers may be executed at high speed and thus confront the enemy with a dominant power in a decisive area. The maximum success may be expected only when the attacking armored force possesses air superiority, surprise, favorable terrain, and the absence or neutralization of massed enemy defensive means. When these factors are present, the armored unit may penetrate a hostile position on a narrow front, and move with devastating effect into the hostile rear areas where are located the command, communication, and supply facilities, as well as the hostile reserves. However, when free to choose, the commander will prefer to avoid the hostile organized position and move deep around the flanks and approach the critical areas over undefended or lightly defended ground. The commander will seek the route which promises most for swift success.

The employment of an armored division on defense denies the opportunity to exploit fully its powers of movement. Units of the support echelon will be used to the utmost. Tanks may employ delaying tactics, and launch counterattacks.

GHQ Tank Battalions and Groups. The Armored Division should be understood as a well-rounded unit of essential arms and services which enables it to operate either in conjunction with other ground troops, such as infantry divisions, or independently on missions which may be distant from friendly troops. The GHQ tank battalions or groups, on the other hand, are provided to assist ground troops and their independent action would be more than unusual.

These units precede, accompany, or follow other attack units, such as an infantry regiment, and enter the action at the decisive time and place as determined by the commander to whom they are attached. As they are essentially offensive weapons their use can be regarded as restricted to the offense except in the counterattack phase of defense.

Typical of the action of these units might be the following. One echelon of tanks moves swiftly upon the enemy position with the mission of destroying hostile antitank guns. The next echelon either accompanies or precedes other attacking units and has the mission of entering and overrunning hostile position just prior to the arrival of the assaulting troops. Hence, tanks, infantry, and field artillery operate as a team in the capture of a hostile position.

TANK DESTROYER FORCE

Introduction. The Tank Destroyer Force is essentially defensive in nature since it is created for the purpose of nullifying the strength of hostile armored power. Its weapons and vehicles are designed to meet and best the tank. The development of this force is another splendid example of the defense rising to meet new-found powers of offense. The struggle is as old as man, or as old as warfare, as you prefer. In World War I the power of the machine gun is held by some authorities to have immobilized armies. The accurate 37-mm gun was designed initially to seek out and destroy hostile machine guns which, easily concealed, required a weapon of great accuracy to counter. But machine guns are easily built in huge numbers and there was no effective means to eliminate them. The losses by troops which attempted to advance against them reached astronomic proportions. The British introduced the tank which was invulnerable to machine-gun fire and had this development been used in sufficient quantities initially there are experts who contend that Germany might much sooner have been brought to her knees. The 37-mm gun then became an antitank gun and the modern race between gunpower and armor really got under way. Artillery of the period had too limited a traverse and required too much time for movement to stop the tank. Tank Destroyer units have taken over the task. The organization, weapons, and methods of operation are not available for open publication.

Characteristics. Logic and analysis can combine to explain the problem which must be satisfied by tank destroyers—a most colorful and completely descriptive functional name for these organizations.

The problem resolves into the development of weapons, means of transport, and methods of employment which will produce characteristics superior from a defensive viewpoint than the tank can throw against them. The weight of the tank holds down its speed; hence, the tank destroyer must be able to move at greater speeds than the tank. Tank operation is limited by terrain, although tanks can move through difficult country which would have stopped them in earlier stages of development; hence, the tank destroyer must have greater cross-country capabilities than tanks. The observation of gunners within tanks is limited and often difficult; hence, the tank destroyers must have better visibility and accept a greater vulnerability. There is a practicable weight limit of the guns which may be used in tanks because of the need for over-all armor protection; hence, the tank destroyer must possess weapons of greater power, and preferably with greater range, velocity, and flexibility. It adds up to a self-propelled gun mount, with great cross-country capacity, light armor, extremely heavy gun power, maximum visibility, speed greater than tanks, and flexibility of operation in all particulars.

Factors in Tactical Employment. The skillful leader of tank destroyer units must first acquire a thorough understanding of tank action, and especially the methods used by hostile tank commanders. To accomplish his mission he must always be a jump ahead of his adversary. The information service must be developed to a high degree of excellence. The commander must be informed when hostile tanks are in his vicinity; he must know where they are; when they move; the routes over which they are moving; and the several destinations which they may have selected. When he has that information he may utilize his greater speed and cross-country capacity to occupy position to intercept the enemy. He must outguess his enemy. An inherent advantage of the tank destroyer is that his mission can be accomplished while stationary. He moves in order to enter a new firing position. His greater gun power enables him to engage the tanks of the enemy before their guns of lesser range can engage him. The tank can also stop to fire and thus increase its effectiveness. But when the tank stops it forfeits its greatest strength in its capacity to move into an area. In fact, the tank destroyer may accomplish its mission in part by preventing hostile tanks from approaching a position. Here are opportunities for the alert, aggressive, commander of the utmost interest and importance. There are ample examples from North Africa of tanks advancing against them to their certain doom. The reading of the possibilities presents a rosy picture of simplicity. The opposite is the truth. It is a battle of wits as well as a battle of power.

AIR BORNE TROOPS

Introduction. It is to be expected that all nations will strive to obtain an ever-widening exploitation of the powers of the airplane. Modern combat resolves into a struggle which includes as a single operation the employment of ground power, armored power, air power, and even naval power, in one integrated effort. The nation which maintains the best coordination between these power elements has the best chance of ultimate victory unless other factors are injected which upset the balance. The use of the airplane in moving troops into battle has progressed to a point of great importance. The Battle for Crete is the best current example but there are others and there will be more. The possibilities are without practicable limit. Details of organization and employment are unavailable for publication.

Analysis of Common Terms. In the United States, the spotlight has been focussed for months upon the parachute troops, or "paratroopers" and indeed theirs is the most spectacular phase of the development. These units are transported in airplanes and land by means of parachutes. Parenthetically, parachute units include their own attached medical personnel and medical officers may apply for this service. Those who join these units will undergo a rich experience. The officers and men are carefully selected and only the most promising applicants are chosen. It is a "volunteer" organization in which esprit is high. The training system through which each member is conducted is superb. When the time comes for the novice to make his first jump, and shout "Geronimo" as he leaves the plane, as other medical officers have done, he will be ready for the experience. Extra pay is involved. The matter of personal hazard is not excessive and anyhow participation in the conduct of war is not famed for safety. The officer whose age permits, who enjoys sports of bodily contact, whose physique is rugged and whose movements are well coordinated should acquire the necessary facility as routine procedure. More than likely he will enjoy the experience. When he has made his final training jump with success he may don the paratrooper's badge and enjoy the camaraderie of officers and men who are knit together by common bonds of exploring a new field of warfare the limitations of which may be beyond our present comprehension.

Air landing troops disembark from airplanes or gliders after reaching the ground. In the presence of the enemy the parachute troops constitute the advance guard for air landing troops, as in the German attack against Dutch cities in the invasion of the Low Countries. These units are organized, trained, and equipped especially for the sort of missions they will encounter and again a unique opportunity is presented to the air-minded medical officer.

CAMOUFLAGE

Introduction. The art of camouflage is a modern essential for all arms and services. Medical units must be adept in certain phases of this subject in their own protection, for the safety of patients in their care, and to avoid disclosing the positions of other components of the force. The commander of troops subject to attack by an enemy, either from the ground or air, will demand concealment of units and installations which, if discovered, may disclose his locations or intentions. Medical units must stand ready to conceal their personnel, transportation, and installations. FM 5-20, EFM, covers the subject.

Purpose and Value. Camouflage is the art of concealing the presence of our troops and their activities from enemy observation, or of deceiving the enemy as to the extent and purpose of our activity where concealment is impossible. In small units camouflage reduces casualties by denying the enemy knowledge of the exact positions occupied by troops, thereby preventing the delivery of accurate, observed fire.

Means of Observation. Two means of observation are available to the enemy, direct visual observation through the eyes of scouts and observers, and indirect recorded observation through the lens of the aerial camera. The data supplied by the aerial photograph is by far the most important source of information open to the enemy, and our own forces as well. Deceiving the expert interpreter of aerial photographs is much more difficult

than deceiving a direct observer. For these reasons the best test of all camouflage is that made by friendly aviation through observation, photography, and report.

Contrast. The camera records and the eye perceives the differences in the appearance of objects due to the manner in which they reflect light. These differences are called contrast. Contrast results from certain characteristics of objects, such as form and spacing, shade and shadow, color, and texture. The whole purpose of camouflage technique is to eliminate contrast or to render meaningless such contrast as does exist.

Form and Spacing. All natural forms are irregular in shape and irregularly spaced. Man is prone to work with regular forms and he spaces them regularly, unless a conscious effort is made to maintain the confusion of nature. Successful camouflage requires that all regularity of form and spacing be avoided.

Shades and Shadows. Shades and shadows are one of the principal sources of contrast, particularly on photographs, and are the means through which form is usually revealed. Shadows should be reduced as much as possible by keeping all works low and by breaking up regular shadows so that they will blend with those naturally present.

Color. Color is more important in direct visual observation than in photography, although similar objects of different colors do show contrast on pictures. The importance of color in camouflage is well illustrated by the protective coloration given the uniforms worn by troops.

Texture. Texture is the ability of a surface to absorb light. It is the source of a great deal of contrast on photographs. The entrance to a deep shelter will photograph black because all the light that enters the hole is absorbed and none of it emerges from the entrance again. The correct camouflage procedure is to hang a curtain over the entrance so that the spot will photograph like the adjacent trench slopes. Tall grass will photograph very dark but one man walking across it may tramp down enough grass to make a distinct path that will show on the picture. The trampled grass has a different texture and will reflect enough light to cause a distinct gray streak when photographed. Obviously, texture has nothing to do with color.

Camouflage Problems. Camouflage problems occur in almost infinite numbers and varieties. Solutions depend upon avoiding contrast. Certain elements of great importance, common to the solution of all problems, are listed below with their relative weights in achieving success in any particular problem.

Choice of position in favorable terrain, 40%.

Camouflage materials, 15%.

Skill in installation, 20%.

Camouflage discipline, 25%.

Choice of Position. Successful camouflage depends very largely on the initial choice of favorable terrain, because the other factors are themselves limited by the characteristics of the chosen position. The particular features to be considered in selecting a position are:

Accessibility by existing roads and trails.

Defilade from direct ground and balloon observation, including flash defilade for guns.

Suitable locations for all necessary auxiliaries, such as kitchens, latrines, ammunition dumps, observation and command posts, animals, and carts. Convenience requires that these installations be near the main position, but they must be kept far enough away so that their discovery will not betray its location.

Natural Cover. Terrain that presents a great variety of contrast in the form of woods and brush, villages and houses, road and trails, gullies, streams, and fence lines is favorable for camouflage works. On the other hand, uniform ground such as pastures, grassland, cultivated fields, and flat sandy waste land, even though covered by low brush, makes concealment of works, and particularly the trails necessary for circulation, almost impossible. The options available to company officers are usually quite limited, but often a change of only a few yards will permit the location of machine guns and other weapons in broken terrain where concealment is relatively easy. Every advantage must be taken of existing opportunities to make concealment easy rather than depending upon elaborate camouflage works after elements of the defense have been located in exposed positions.

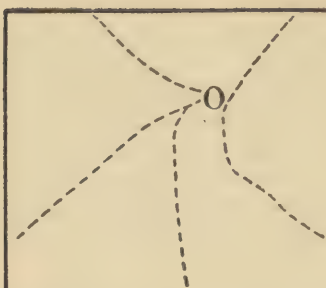


Fig. 1 TELL-TALE TRACKS

They indicate something of importance at O, although the object itself is not visible.

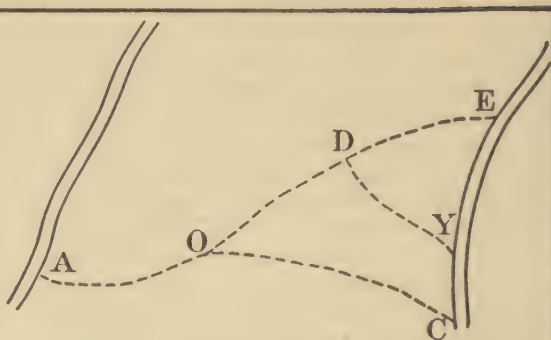


Fig. 2 CONTINUOUS TRACKS

If the tracks are carried past the locality to which they really lead (O) they do not betray its importance. But a junction is suspicious, hence O-C should be suppressed and a dummy path D-Y, put in.

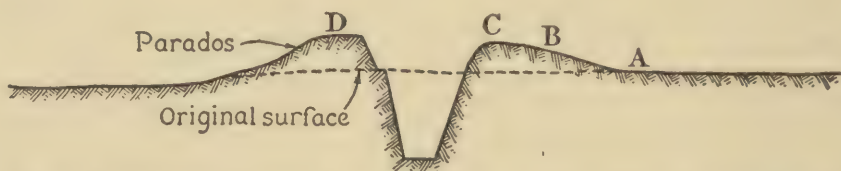


Fig. 3 CONCEALING A TRENCH FROM GROUND OBSERVATION
A-B-C-D should appear as a continuous line



Fig. 4 CONCEALMENT AND COVER ARE AFFORDED BY A PARAPET WITH AN IRREGULAR CREST

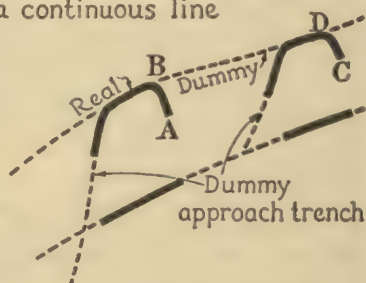


Fig. 5 CONCEALMENT OF COMBAT GROUPS BY DUMMY TRENCHES
The arms A-B and C-D are concealed by nets.



Fig. 6 OBSTACLE CONCEALED IN AN ARTIFICIAL DEPRESSION

Tracks. The most obvious sign of military activity is the record of movements made on the earth's surface in the form of tracks. This record is relatively permanent and can, therefore, be photographed and studied at leisure by the enemy. For this reason important works and activities are betrayed by tracks and paths more frequently than in any other way. Tracks already in existence should be used as far as possible and movements should be confined to a minimum number of these tracks. Where a new road or path to a position is unavoidable, it should be carried on to a dummy position, another road, house, or other false destination. Circulation should be one-way to insure that no part of a road appears unused.

Camouflage Materials. Camouflage materials are of two kinds, natural and artificial.

Natural materials. In open warfare only natural materials will be available in sufficient quantities for effective work. These materials include such items as trees, brush, sod, top soil, and debris found in the locality. Their availability and use make the reproduction of the local forms, textures, and colors relatively easy if they are carefully placed and properly maintained.

Artificial materials. The most common artificial materials used in camouflage work are:

For coverings: canvas, burlap, cotton sacking, and visinet drapes.

For coloring: aniline dyes water paints, whitewash, and mud.

For erection: poles and stakes, smooth and barbed wire, chicken wire, fishnets, and nails.

Skill in Installation. *Flat-tops.* The most important application of both natural and artificial camouflage materials is in the installation of what is known as a *flat-top*. A flat-top consists of wire netting or fishnets, garnished with burlap or natural materials of suitable color and texture, and supported in position parallel to the ground surface by smooth wire stretched over poles and anchored by stakes. It is used where the establishment to be concealed is low and the flat-top can be made to blend into the background. The emplacement or other object to be camouflaged is covered by the flat-top and the flat-top is garnished so that it presents no contrast with its surroundings and simply disappears. The skill necessary to make the flat-top appear natural can be acquired only by long study and constant practice.

Camouflage Discipline. Camouflage discipline is habitual obedience to the rules of individual and collective conduct necessary for the concealment of activities and establishments from enemy observation. Every soldier should learn to act at all times as if he knew himself to be under observation by the enemy. It is of little use to screen an important position if the men come out from under the screen and stand in groups to watch hostile aircraft passing overhead. The conduct of personnel should be uniform and consistent. If troops are known to be in a certain locality, their daily habits may be very closely studied by enemy observers. Any change in these daily habits indicates a change in the military situation.

Details of Camouflage Discipline. Camouflage discipline involves the continuous application of common sense rules of conduct. Some of the more important of these rules are:

Never expose yourself unnecessarily to any possible hostile ground or air observer. Men in trenches should crouch in the bottom when enemy aircraft is overhead.

Movement attracts attention. Hence, avoid all unnecessary movement.

In moving about follow the prescribed routes and do not make new tracks to important localities.

Keep off skylines; move and remain in the shadows as much as possible.

Do not stand in groups in the open, especially near important places such as machine gun emplacements, and observation and command posts.

No parking of vehicles or animals in the vicinity of any vital position.

Unusual activity of any sort is almost certain to attract attention and should be avoided or always carefully concealed.

Avoid doing anything that will cause a change in the previous appearance of the ground. Excavations, piles of supplies and materials, or refuse of any kind are plainly

visible. Do not throw trash around where it can be seen. Bury it in concealed trenches.

Do not expose highly colored or shiny objects.

Smoke is very conspicuous and is sure to attract attention. Avoid fires. It is helpful to break up the column of smoke from kitchens by placing them under large trees, in buildings, or by stretching a shelter half a foot or two above the flue.

Examples. Camouflage requires close attention to minute details. Common sense is the main ingredient of success, particularly in open warfare where both time and materials are limited. The study of examples of both successful and unsuccessful camouflage is a valuable aid in attaining proficiency in the art. Failures are often most instructive. The following cases illustrate some typical faults.

A couple of truck loads of footbridge equipment were brought up at night and concealed on a stream bank in heavy underbrush and drift. The stream had recently been in flood, and the underbrush was mud-covered and brown. But the footbridge equipment was covered with green pine boughs, and the mound of green in a field of brown was the most conspicuous object for miles. The camouflage material selected was wrong in color. Scattering the bridge sections around in small irregular piles, and covering them with mud and debris to make them look like drift probably would have been effective and have required less work.

Squad trenches were dug in very broken, washed, sandy clay. Before they were covered with underbrush, the parapets were beaten with the flat of a spade to insure "a neat, soldierly job." The smooth glittering surfaces were apparent in places through the covering of brush because they were the only unweathered surfaces in sight. In this case the texture was wrong.

A battalion train was halted in a clearing. The wagons were carefully backed into the woods, the animals tied up among the trees, and pine saplings leaned against the wagon covers; then—the harness was carefully piled on the wagon poles, extending into the clearing, where it looked exactly like harness piled on wagon poles at intervals around an otherwise empty clearing. Thus, carelessness in details spoiled an otherwise good job.

A reserve company marched to a large clearing in the woods, stacked arms in the open, and then concealed itself in the edge of the woods, leaving the arms' stacks shining in the sun.

SCOUTING AND PATROLLING

Scope. Scouting and patrolling deals with the duties of individual scouts and small dismounted patrols which operate on missions of reconnaissance, or security, or both. Raiding parties sent into hostile positions by surprise action to capture prisoners or for other purposes operate in a similar manner. Detachments performing these missions must be able to operate by day or night over varied ground and frequently close to or within the enemy position. This duty requires a high degree of training in concealment, movement, and observation.

Importance to Medical Personnel. The duties performed by scouts and patrols are hazardous and casualties are probable. Many of these parties are required to be accompanied by medical personnel.¹ Aid men of companies, litter bearers, and contact agents with medical detachments serving infantry regiments will be drawn upon for these assignments. The same personnel will require much the same training incident to searching a battle field for wounded and evacuating wounded, when under hostile observation or fire.

Suggested Instruction for Medical Personnel. Selected personnel of medical detachments with infantry, it is suggested, should be trained in the following subjects included in Scouting and Patrolling.

Missions of scouts, patrols, and raiding parties.

Equipment.

Formations by day and night.

¹ The exploit of the 1st Battalion, 26th Infantry, commanded by Major Theodore Roosevelt, Jr., on June 29, 1918, is particularly informative. It is discussed on page 43, *Infantry in Battle*, United States Infantry Association.

Routes followed by day and night.

Concealment by day and night.

Movement by day and night.

Control signals.

FM 7-5, *Infantry Field Manual*, and FM 21-45, *Scouting and Patrolling*, are source references. The training goal might well be to provide sufficient training to enable medical personnel to accompany such detachments with safety to themselves, the casualties for whom they may be obliged to provide care, and to avoid acts which would interfere with the accomplishment of the mission of the detachment. As in other operations, accompanying medical personnel must be able to function as a part of the tactical structure, using methods which are in consonance with the force as a whole.

Missions of Scouts, Patrols, and Raiding Parties. A *scout* is a soldier whose duty is to reconnoiter or to gain information of the whereabouts, movements, and condition of the enemy.

A *patrol* is a detachment of troops sent out from a larger body on a mission of reconnaissance or security, or both. Patrols are classified in accordance with the mission upon which sent, such as reconnaissance patrols, visiting patrols, combat patrols, flanking patrols, or connecting patrols.

Raids upon hostile units are conducted (by raiding parties which operate as patrols) to capture prisoners for identification of enemy units and for other purposes.

Equipment. The arms, equipment, and clothing of patrol members will vary with the seasons, light, weather, geographical location, mission, and character of operation. The usual items of equipment of a patrol operating in daytime are rifle or pistol, haversack with rations, canteen, map, compass, watch, pencil and paper, field message book, field glass, and a cloth cover for the helmet. White uniforms, snowshoes, and skis may be used in snow. At night the helmet and bayonet may be discarded. The following articles may be added: riot gun, trench knife, clubs, blackjack, brass knuckles, sweater, knitted cap. Articles which rattle or glisten in light must be avoided. The mission and probable action of a patrol will determine its equipment.

Formations. The formations used must facilitate control by the leader and provide concealment and safety. They must facilitate immediate action to the front or flanks. They will be altered constantly to meet the changing terrain and visibility. All formations should provide a point, flank protection, and a rear point. The leader goes wherever his presence is necessary, but a position near the center is used most frequently. A patrol of six or eight men might be deployed during daylight, for example, 100 or more yards in depth and 50 or more yards in width. At night, distances are greatly reduced.

Routes, Concealment, and Movement of Patrols. The route to be followed by a patrol will be carefully planned in advance, by map study if necessary. The time and place of leaving and reentering the friendly lines will be arranged.

During daylight, concealment from hostile observation is necessary. Visible movement discloses the presence of men instantly. Hence, patrols take the fullest advantage of natural cover, detouring around exposed areas. Before entering a new area, the patrol will halt and study it carefully before venturing forward. Silence is important, but concealment from observation during daylight is vital. Training is conducted to enable men to select routes by which they may move without being seen, and in the study of areas to detect the presence of an enemy as well as to select the route to be followed.

During darkness, movement without noise is the vital factor. Routes in open spaces free from underbrush, leaves, and twigs or fallen branches are preferred. Even at night, however, movement across a skyline is visible for considerable distances. Training is conducted to enable men to move without being detected under the cover of darkness.

Control and Signals. During daylight, visual signals are used by the leader to the maximum extent. Simple, visual signals are used for the following (See *Infantry Drill Regulations*, Chapter 11): *Forward*, *By the right (left) flank*; *To the rear*; *Halt*; *Lie*

down (or Take cover); Double time (or Rush); Change direction; Assemble; As skirmishers; Are you ready (I am ready); Enemy in sight.

At night, hand signals cannot be seen, and talking or whispering betrays the patrol to the enemy. Control signals should be familiar night sounds and as little like human sounds as possible. The following are suitable examples: the scraping together of two sticks or stones, the rustling of a piece of paper, imitation of birds, animals, or insects. Whatever its nature, the signal should be only loud enough for all members of the patrol to hear. By such signals it must be possible to stop and move forward or check to see that all members are present.

CHAPTER III

ORGANIZATION OF LARGE UNITS

Introduction. The military structure consists of units of the separate arms, and units of the combined arms. The former term applies to squads, platoons, companies (troops, batteries, flights), battalions (squadrons), regiments, and brigades; in these organizations are found officers and men of the same arm or service, as infantry, members of medical battalions and regiments and others. It must be remembered however that medical personnel forms an organic part of regiments and separate battalions as attached medical detachments. These units are also classed as "small units." The term "large units" applies to divisions, corps, armies, and groups of armies, which include components drawn from all or several of the arms and services. In the infantry division, for example, are "small" units of infantry, field artillery, combat engineers, quartermaster, signal, and medical.

The organization of all military units is subject to constant and progressive change. A new weapon, vehicle, or tactic may cause sweeping changes in organic structure. In war a new art or invention will be adopted as soon as developed and tested. The Army of the United States organizes and reorganizes on the basis of swiftly changing conditions and newer tools. For these reasons it is no longer wise to disclose for general distribution details of organization or armament which may aid our enemies. Hence all recent changes in our organic structure of combat units has been excluded in this edition. New lessons are still to be learned. As time passes still further changes in the details of organization are to be expected.

BASIC STRUCTURE OF THE ARMY

Chapter I contains information on the components and structure of the Army of the United States. From a combat viewpoint, it consists of the Army Ground Forces, the Army Air Forces, and the Services of Supply. This is an inadequate picture in a sense for there are also the Defense Commands, theatres where contact may be forced or expected with our enemies, Air Forces, and the many task forces which are now far-flung about the world.

Within continental United States the Army Ground Forces consists of its headquarters, the Replacement and School Command which controls the operation of the replacement training centers, special service schools, officer-candidate schools of the ground arms; the Antiaircraft Command; the armies, corps, and divisions which form its component parts. It may be regarded as a huge training organization since it is the agency which activates new ground combat units; fills them with officers and men; trains and equips them to the point where they are ready for combat. In an overseas theatre the ground forces are the ground component of the air, ground, service of supply and even naval forces which are placed under a single commander.

The Army Air Forces are the air component of the army. They include the many air commands which are necessary for its training and development, and the fighting or service units it requires in combat. The novice will not understand that many ground units (but not necessarily units of the Army Ground Forces) are required within the Air Forces. For example, there are quartermaster, ordnance, medical, signal, engineer, and other components of an Air Force. The ground arms and services furnish large numbers of officers and men for these assignments.

The Services of Supply function equally for ground and air units. Under the conditions of global war with which we are now confronted, the lines of communication devised, maintained, and serviced by the Services of Supply stretch amazingly around the sea lanes of the world and across continents. They may be said to stretch from the factories of the middle west by rail, ship, and airplane to each continent and to a multitude of islands throughout the world wherever American soldiers are stationed. These soldiers must be supplied with food and clothing, guns, tanks, and planes; ammunition, medical and other supplies of infinite variety. Without these essentials

they would be doomed just as were the heroic defenders of Bataan. The gigantic tasks of procurement of raw materials, manufacture, transportation, storage, distribution, repair, and salvage must be solved adequately before victory can be achieved. The operation of lend-lease adds enormously to the task, for the United Nations look to the United States for the tools they must possess. The wastage and destruction of war is utterly beyond the comprehension of those who have not witnessed the phenomenon. Balanced units of the Services of Supply accompany ground and air units wherever they operate. Often they precede them. For these tasks our army has the supply services which function under the Commanding General, Services of Supply.

LARGE TACTICAL UNITS

The Army. The *army* consists of a headquarters, certain organic army troops, and a variable number of divisions. These divisions, together with certain auxiliary troops called *corps troops* are organized into *corps* each with a corps headquarters. Troops of the GHQ Reserve and aviation may be attached to an army as needed.

The army may be regarded as an administrative unit in the same sense as a division, a regiment, a company. This is true because it possesses in army troops the required service units for supply, evacuation, and transportation. These units consist of medical units, quartermaster units, and certain ordnance, signal and miscellaneous units. In the army troops are also combat units such as antiaircraft artillery, aviation, field artillery, engineers, and others. The army troops are visualized best as being constituted especially to meet the size of the army, which is variable, and the special conditions of terrain or combat it is expected to encounter.

Armies are designated by number, thus: *First Army*. But not *1st Army*, nor *I Army*.

The Corps. The *corps* is the unit next smaller than the field army. It consists of a corps headquarters, certain organic corps troops, and a variable number of divisions. The corps troops consist of combat elements and service elements. The combat elements include field artillery for the support of the corps as a whole, anti-aircraft artillery, combat engineers, and reconnaissance units. Its service elements are provided for the corps troops although certain ordnance units may be included for the corps as a whole. Unless reinforced by additional service units, the typical corps would be incapable of independent operation. In practice, it is unlikely that the corps troops would ever follow one organizational pattern and each would be constituted to meet the special conditions of terrain or combat which it is expected to encounter.

Corps are designated by number, thus: *I Corps*, *II Corps*, etc. Not *First Corps*, or *1st Corps*. The expression "*EYE*" *Corps* for *I Corps* is meaningless and confusing.

Divisional Organizations. The *division* is the basic large unit of the combined arms. There are many varieties and types of division. Fortunately, each follows a typical pattern and a thorough understanding of one will help immeasurably in gaining an understanding of others.

The term is defined as a unit comprising a headquarters and troops of essential arms and services, all in correct proportion, and so organized as to make it tactically and administratively a self-contained force capable, to a limited extent, of independent action.

The armies of the great powers include divisional organizations of the following types although the interior structure of the several armies is subject to considerable variation.

Infantry Division
Cavalry Division
Armored Division
Mountain Division
Motorized Division
Air-borne Division

There is nothing sacred or limited about the types of division. There might for example be a desert division, a jungle division, or any other sort which would gain an advantage over the enemy. Further, the size, equipment, and interior organization must be altered whenever ways are devised to attain improvement.

Whatever the form or purpose of a divisional organization it will be found to con-

tain the three basic components or elements: *Command, combat, and service*. Description of armored divisions usually separate into *command, reconnaissance, striking, support, and service* elements. This classification is applicable equally to each of the several types and is adopted herein to emphasize the similarity of structure.

The commander and his staff constitute the command element. In large units the staff includes a general staff section and a special staff section. A broader concept would place the signal unit (divisional signal company, for example), the military police company, and the headquarters company within the scope of the term, *command element*, since each of these organizations are provided to facilitate the exercise of command or control.

Information of the enemy is important equally to commanders of each type of division. A modern development has been the placing of a unit specially organized, equipped, and trained for reconnaissance missions. In earlier organizations horse cavalry was used for ground reconnaissance and was attached to the division, or operated under the corps commander in securing information. The division commander is now provided with his own organic reconnaissance unit in the current divisions and usually consists of a company or larger unit equipped with scout cars, motorcycles, or other light, swift vehicles. Radio equipment is standard. This unit constitutes the reconnaissance element of the division, although each subordinate component is provided with reconnaissance personnel and equipment for its own purposes.

The striking element consists of the component of the force which leads the way in contact with an enemy. In the infantry division, motorized division, or mountain division, it is the infantry regiment or regiments. In the cavalry division it is the cavalry regiment. In the armored division it is the armored tank regiment.

The support element is quite similar in all divisions. Field artillery is the primary component. It adds power to attack or defense; it contributes depth to battle by use of its great range; by swift changes in direction of fire it supplies a factor of flexibility enabling the commander to effect the outcome by engaging hostile targets which otherwise might achieve success by surprise action from an unexpected direction. By counterbattery fires it reduces the effect of hostile artillery and antitank guns. Modern artillery is effective against tanks since it is equipped to follow moving targets and engage them with accuracy. Combat engineers are part of the support element since they execute demolitions, install mines, lay out positions, mark routes, improve routes of communication, repair bridges and culverts, and other tasks, as well as standing available for combat employment in case of dire necessity. In the armored division the infantry regiment may be regarded as part of the support element.

The service element of each division includes the medical battalion, the quartermaster battalion, and ordnance units. The presence of these units enables the division to sustain itself in action since it can evacuate its casualties within the division area, supply itself with food and ammunition, and repair its guns and weapons to a limited extent.

Divisions are designated by number and type, thus: *1st Infantry Division*, (but not *First Infantry Division*, nor *I Infantry Division*); *1st Armored Division*; *1st Cavalry Division*; *1st Motorized Division*, and so on.

REINFORCING UNITS

Source and Purpose of Reinforcing Units. The organic units of a military force are prescribed by tables of organization issued by the War Department. In all cases the supporting units, such as field artillery, and service units, such as medical and quartermaster organizations, are provided in a strength sufficient only for normal operations and tactical missions, if there is in fact such a thing as a "normal" operation in campaign. They are not burdened with units for which there is not a continual need. It is a principle of command that the assignment of a mission should be accompanied by the allotment of means sufficient for its accomplishment. This condition requires the allotment, from time to time, of reinforcing units.

The necessity for allotting reinforcing units is more general for divisions or corps

which are operating on independent missions. In such a case the reinforcing units are attached temporarily to a subordinate command at which time they function as directed by the commander of the unit to which attached in the same manner as his organic units. A division operating as part of a corps may also have reinforcing units attached in the same manner, but in many instances it may be provided with additional aid by units which continue to operate under corps control. For example, observation aviation attached to a division would receive orders from the division commander; if not attached, it might execute the same missions upon request of the division submitted to the corps commander who would direct that the mission be executed. This permits the same unit of observation aviation to execute missions for several units of the corps, each executed under corps control.

Reinforcing units are furnished from organizations available to the next higher commander for employment or allotment. A division commander might reinforce an infantry regiment which is sent on an independent mission with field artillery, engineers, medical units, quartermaster units, and other organizations to meet their requirement. Similarly, a corps commander might reinforce one or more of his divisions from his corps troops. In many instances reinforcing units will be furnished from GHQ reserve. In all cases units attached revert to their former status for control when released from attachment.

As a further aid to visualizing the need for reinforcing units, consider the problem of an infantry division making a river crossing in the face of anticipated strong resistance. It has the immediate need for engineer ponton companies to cross the initial combat teams by means of assault boats, and for the construction of ponton bridges on which to move the heavy weapons and equipment. There will be a need for construction of approaches to the river to reach the ponton bridge for which still more engineer troops will be required. The enemy may seek to destroy the ponton bridge by use of aviation, and this forces the employment of antiaircraft artillery. Chemical units may be necessary for laying smoke to screen the crossing in order to reduce the effect of hostile aimed fire. Strong artillery support to protect the units making the initial crossing may be necessary, and additional field artillery units may be provided. Distant reconnaissance beyond the scope of ground agencies may be desirable to locate the positions of hostile reserves and their movement to block the crossing; observation aviation may be provided for this mission. The need for tank units may be foreseen as soon as they can be crossed on the ponton bridge; if this is the case they may be furnished from GHQ reserve. The principle should be appreciated that means must be furnished in accordance with the requirements of the assigned mission.

For purposes of convenience, problems given in the Army Correspondence Courses and at the general and special service schools often make use of such terms as "The 1st Infantry Division Reinforced" without specifying the nature and extent of the reinforcements. In such a case the units included are stated within the problem or listed in special tables of organization which are quoted. It is important that the attached units be definitely ascertained and their use provided for in the contemplated action in the same manner as the organic units.

TASK FORCES

Definition. A *Task Force* is a temporary tactical unit, composed of elements of one or more arms and services, formed for the execution of the specific mission or operation.

In its smaller concept, in an infantry division for example, the term *combat team* is usually applied to a task force consisting of a regiment of infantry, a battalion of light artillery, and essential units of other arms in suitable proportion. In the armored division, the *combat command* includes an armored (tank) regiment, a battalion of artillery, and essential units of other arms. It is a grouping of command, combat, and perhaps service elements within the division to accomplish a specific task. Such groupments are often maintained as standing operating procedures in order that greater teamwork may be developed.

Most large forces operating in a theatre are organized as task forces. Consider for example the components of the forces which have occupied bases in the Pacific such as Hawaii, New Caledonia, Dutch Harbor, and others. Each is faced with special

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problems of terrain, distance from a base of supplies, and enemy action. It is natural to expect that each constitutes a specially created task force consisting of a balanced ratio of ground, air, service, and even naval units to meet its own situation. They consist of forces which are formed of units deemed adequate for the accomplishment of the mission assigned. In a still larger conception the American Expeditionary Force of World War I was a task force.

CHAPTER IV

TACTICAL EMPLOYMENT OF THE COMBINED ARMS

*It ain't the guns or armament, or
the money they can pay,
It's the close cooperation that makes
them win the day;
It ain't the individual, nor the army as a
whole,
But the everlastin' teamwork of
every bloomin' soul.*

—J. MASON KNOX in *Coöperation*

INTRODUCTION

This chapter presents several phases of the tactical employment of the combined arms. Large scale military operations consist of the joint action of each of the arms and services, organized into divisions, corps, and field armies, in the accomplishment of a single assigned mission, or objective, in accordance with the will of the commander as expressed in orders. At the outset it must be realized that unity of effort is essential to success. This means that each of the separate arms and services, and each unit in which they are organized for functional purposes, must operate in such a manner that each accomplishes its assigned task, and coordinates its action with others to the end that the action of the whole is directed towards a common goal. No one arm or service operates alone or wins battles alone. It is well to remember that. Each contributes something that is vital, something that cannot be omitted, to the action of the whole force.

The military student should start with a study of the mission, equipment, organization, and tactical employment in battle of each of the several components. He may then proceed to an analysis of the action of large military forces of the combined arms, in all of the wide pattern of battle conditions. When this study is reinforced with actual experience or observation, even in maneuvers, and in the study of historical illustrations, his understanding of the infinite variety of battle conditions is expanded. If he will then obtain a thorough understanding of the tactics and technique of his own arm or service, and a proven ability to execute its numerous arts, he is better equipped to function as a member of a tactical team. That is the goal. It is not easy of accomplishment. Even the best officer can be expert in but a very few phases of the tremendous scope of military operations. But a wide understanding and appreciation of many of its phases is possible of attainment.

This chapter presents an analysis in brief of the following battle phases and is presented to the military student as an approach to the study: *Marches, Security, Offensive Combat, Pursuit, Defensive Combat, Withdrawal from Action, Delaying Action, Retirement, Antiaircraft Defense, Antimechanized Defense, mountain warfare, desert warfare, jungle warfare, attack and defense of river lines and Standing Operating Procedures.*

MARCHES

Importance. The ability of a command to concentrate superior forces where required depends in large measure upon the march capacity of the troops.

Ability to march long distances, in good order, and arrive in condition fit to fight has long been recognized as a unit of measure of the combat worth of an organization. Motorization has eased the difficulty of marching, in some particulars, but has not reduced its importance. Some men may "march" in motor vehicles, rather than afoot. Individual equipment heretofore carried on the backs of men, may be transported in trucks. The use of combat vehicles as a means of transport is a material aid. But the art of conducting marches includes movements by motor transport, and the need for careful planning is in no way reduced. Nor is motor transportation available in such quantities as to free any considerable portion of combat units from the recurring necessity of marching.

It is hard to endure long marches. In campaign, marches must be conducted with little regard to weather. When men march through mud or snow, at night, in rain, or in the sweltering heat of summer through the dust-laden air of dirt roads, serious strains are imposed upon their endurance. With all the hardships, except for physical incapacity to continue, men cannot be allowed to break ranks. The march must continue.

The planning of a march requires skill and foresight on the part of commanders and staffs. When a command marches in several columns, by different routes, and at varying rates, coordination is required, or confusion and delay will be inevitable. Training of the staff in planning the march is an important factor in the marching ability of large units.

Purpose of Marches. The purpose of marches is to place the troops at the *desired place*, at the *desired time*, in *proper condition* for the contemplated duty.

In the execution of marches to attain these purposes, the following principles must be observed:

- (1) To facilitate any maneuver that may be necessary or desirable. This includes an analysis of the enemy's capabilities.
- (2) To assure speed of movement and rapidity of deployment. This includes judicious use of means of transport, arrangements to facilitate ease of marching, and the arrangement of the components of a command in a suitable formation for prompt entry into action.
- (3) To conserve as much as possible the strength of troops.
- (4) To protect the troops from attack by hostile aviation and mechanized forces or surprise attack by other ground troops.

Rates and Lengths of Marches. Rates and lengths of marches are subject to variation from the effects of weather, the size of the command, the condition of roads, the weight of individual equipment for which transport cannot be provided, and the nature of the terrain. The accompanying table shows the average rates and lengths of marches under different conditions and methods of transport.

Unit	Average Rates of March (mph)				Lengths of March
	On Roads		Across Country		
	Day	Night	Day	Night	
Foot troops -----	2½	2	1½	1	12 for a division 15 for smaller units
Tanks, truck-drawn light artillery, cavalry combat cars, trucks, ambulances, motorized units --	25	25 ¹ 10 ²	8	5	150-175
Horse-drawn artillery -----	3½	3	3	2	20
Cavalry, animal elements -----	6 ³	5	5	4	35
Cars, armored or scout -----	35	35 ¹ 10 ²	10	5	200

¹ With lights. ² Without lights. ³ May exceed this rate for short distances or limited periods.

Troop Movement by Motor Transport. Few units within the infantry division are fully motorized. When it is desired to move an entire division at one time, additional vehicles must be attached for the purpose from the quartermaster truck battalions of the corps and the army. Based upon 12 men with individual equipment to each 1½-ton truck and 20 per 2½-ton vehicle, the following numbers of *additional* trucks are necessary to haul representative war-strength units:

	1½-ton	2½-ton
Infantry battalion	35	21
Infantry regiment	121	74
Infantry brigade	244	150
Infantry division	544	334

It is practicable to move an entire infantry division by its own organic transportation. To use this method it is necessary to divide the force into two or more subdivisions, each to be transported separately. For tactical moves each subdivision should be formed into

a balanced fighting team. Cargoes of the organic vehicles are unloaded at the point of origin of the movement, or delivered at the destination, as desired. The trucks are then made available for the movement of each subdivision in turn. This process is called "shuttling." The distance which may be covered by a force in one day depends, among other factors, upon the time required for loading and unloading and the total number of trips required. It has been determined that it is reasonable to move an infantry division 75 miles in one day by this process under favorable conditions. The minimum distance at which it is faster to move by the shuttling process than by marching is considered to be 12 miles for a large force.

Each subdivision must provide its own security measures while en route, including adequate measures against attack by air or mechanized units.

Definitions of Common March Terms. *Daylight march.* A march which begins and ends in daylight. Except in oppressive heat they are easier on the troops than night marches. The hazard of attack from the air or by mechanized forces may require special precautions.

Night march. A march which begins and ends in darkness.

Forced march. A march in which the distance covered in a single stage is greater than normal, or in which the distance covered in several stages is accomplished in a time less than that which would be employed in marching by normal stages with normal long halts. A march by foot troops longer than 15 miles in a single stage is a forced march. Forced marches seriously impair the fighting efficiency of even the best troops. They are undertaken only in cases of urgent necessity. Troops should be informed why the march is necessary.

Cross-country march. The tactical situation may require a marching column to leave the road and move across-country at a reduced rate. If made at night such marches are most fatiguing as well as difficult to control.

Non-tactical march. A march conducted when contact with an enemy is impossible. The comfort and convenience of troops becomes the dominant consideration. Ease of marching is enhanced by forming march serials of units having the same march rate.

Tactical march. A march conducted when contact with hostile ground forces is possible. Under these conditions columns are constituted in such a manner as to be quickly developed for battle.

Marches for training and concentration purposes. Marches conducted in the course of training are for the purpose of instilling knowledge in how to prepare for the march, for enforcing march discipline, and for hardening the men. Since they are usually conducted in time of peace, or if in time of war at places remote from interference by the enemy, they are conducted so as to best facilitate their purposes and with every consideration being given to the comfort and convenience of the troops participating. Marches conducted by green or inexperienced troops are short. As experience is gained, and the troops become trained and hardened, the length of the daily march is gradually extended until the maximum rate and distance can be accomplished without difficulty.

Marches for concentration purposes are conducted for the purpose of gathering together the scattered elements of a large command. Depending on the situation, speed is sometimes necessary, and the daily marches may be longer than those for training purposes. Since marches for this purpose, however, are usually conducted without the probability of enemy interference, primary consideration is given to the comfort and convenience of the men.

March unit. The movement of marching troops is based upon a unit that halts and moves at the command or signal of its commander. This is called the *march unit*. In the infantry and horse-drawn artillery the march unit is the battalion; in the cavalry, the squadron.

Road space. The road space of a unit is its length from head to tail when in prescribed march formation.

Time length. The time length of a column is the time in minutes required by the entire column, moving at a given speed, to pass a given point. This is determined by dividing its road space in yards by its speed in yards per minute.

Time distance. This is the time required to move from one place to another at a given speed. It is determined by dividing the distance between the two points in yards by the rate of march in yards per minute.

Initial point. The initial point is an easily recognizable topographical feature, such as a road junction or house, at which units which are to be formed into a march column arrive at the exact minute to take their places in the column. It should be so selected that no unit is forced to march to the rear in order to reach it.

Hour of arrival. The hour of arrival is the hour at which the head of the march unit reaches the initial point.

Hour of clearance. The hour of clearance is the hour at which the tail of the unit (march unit) passes the initial point.

Order of march. In a non-tactical march units are arranged in order in the column or columns to enhance the comfort and convenience of the troops. In a tactical march a column is arranged from head to tail in the approximate order of entry into combat.

Column combat teams. When a large force marches in several columns, each column may be formed of units which will facilitate effective entry into combat. These are often referred to as column combat teams or march groups. For example, a column might be formed to include a regiment of infantry, a battalion of light artillery, a small engineer unit such as a platoon, and a medical detachment from the division medical battalion.

Stage. A march stage is a distance covered by marching which is broken by a long rest period of several hours. Normally, it is a march between bivouac areas. A march in several stages is one which is too long to be made in a continuous movement; the time en route is broken by one or more periods to allow the troops to rest and recuperate.

Coordinating point or coordinating line. Control of a large command marching in several columns is often a difficult procedure. When contact with an enemy is possible it may be desirable to maintain a fixed formation, as columns abreast or echeloned to the right (left) rear. The routes of the several columns will often vary in length. This can result in disrupting the desired formation. A coordinating point, or series of points, may be designated by the commander for each column with the prescription that it be reached, passed, or cleared at a stated time. A coordinating line, such as a road crossing the several routes, is used in the same manner. By this process some units will be required to halt until others reach the coordinating point, whereupon the advance of the force is resumed in the prescribed formation.

Preparation for a March. Preliminary preparation contributes to the success of a march. The commander and staff must plan the march in all of its details, including selection of routes, time of starting the march, formation, and security measures. A warning order issued to subordinate unit commanders enables them to make orderly arrangements to facilitate the movement.

Upon receipt of information from a superior that a march is to be made at a certain hour and date, or to be ready to march with a definite short notice, the commander of a subordinate unit should begin preliminary arrangements without undue delay. These preparations may include the following:

- (1) Notify subordinate officers, and key noncommissioned officers (1st sergeant, mess sergeant, supply sergeant, stable sergeant), of his plans for the march.
- (2) Make or direct a thorough inspection of all vehicles for condition, lubrication, equipment, and loads.
- (3) Determine the exact minute for beginning the march so as to join the battalion or squadron when directed.
- (4) Make or direct a thorough inspection of the feet of the men, including the fitting of shoes and socks.
- (5) Make or direct a thorough inspection of saddles, packs, and harness for condition, cleanliness, and state of repair.
- (6) Determine the hour for serving the last meal preceding the march.

- (7) Determine the type of food to be carried on the march.
- (8) Determine the hour when tents will be struck (if necessary) and equipment loaded on vehicles.
- (9) Determine the hour when animals will be fed, watered, harnessed, or saddled.
- (10) Determine the type of equipment to be carried and the uniform to be worn.
- (11) Issue an oral or written warning order to the command embodying all of the above pertinent details.
- (12) Require canteens to be filled before starting the march.

Forming the Column. Units in camp or bivouac are usually somewhat scattered and, when consolidated for a march, must be gathered together with the least practicable loss of time and effort (see Plate 1). Companies, troops, and batteries are usually first consolidated into their respective battalions or squadrons, and these are in turn conducted by their commanders to an assembly point of the regiment. For this purpose the battalion or squadron commanders announce an initial point for their units and the time the head of

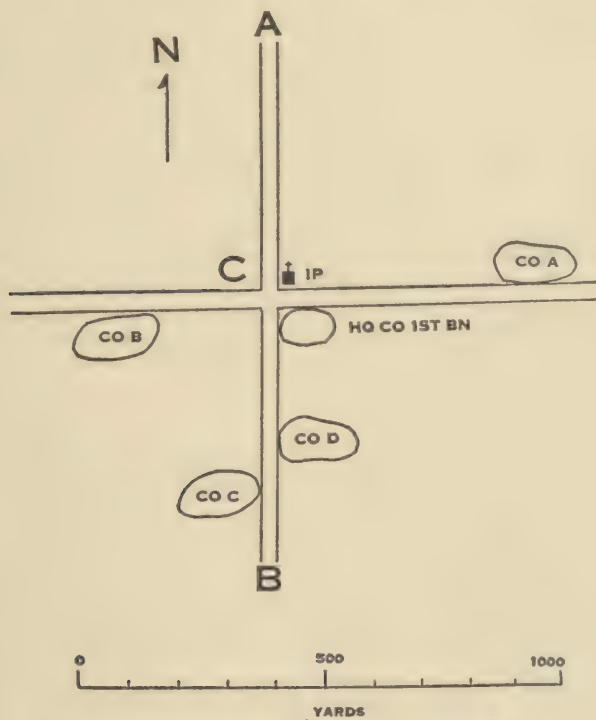


Plate 1. Battalion in Bivouac Prior to a March.

the unit will pass that point en route to the regimental rendezvous. It is the duty of each subordinate leader to so time his departure from his own bivouac, to so choose the most direct and practicable route to the battalion or squadron initial point, and to so regulate the speed of his movement as will enable his unit to arrive at the exact moment necessary to join the column without waiting, without countermarching, and without interfering with the movement of other units. To determine these factors, an exact knowledge of road spaces, time length, rates, and time distances is necessary. Marches to the rear to reach the IP are objectionable.

Route Reconnaissance. No steps must be left undone to make certain that chance of losing the route is eliminated. The confusion, loss of time, and reduction of morale caused by countermarching to correct an error must be avoided. Whenever it is possible to do so, reconnaissance of routes should be made prior to the beginning of the march. Guides

may be stationed at points of change of direction or markers placed to indicate the way. The need for guides is increased during a night march.

Protection against Air Attack. Troops in march formation are especially vulnerable to attack from the air. Night marches reduce but do not eliminate this hazard. Safety is increased by requiring more distance between units, such as 50 yards between platoons. Units provided with weapons capable of delivering antiaircraft fire should march ready for action. Other units, such as a medical regiment which has no arms, should be protected by a machine gun unit of appropriate size placed nearby. All men should be trained in the methods of antiaircraft defense so that appropriate action may be taken at once upon order or signal.

Conduct of the March. *Rotation of march units.* March units within a larger force are rotated daily; that is, the battalion or squadron which leads the regiment today will be the last element in the column tomorrow. Within each march unit companies, troops, and batteries, and within such units, platoons, are similarly rotated, except that the heavy weapons company of the infantry battalion is usually the last element in the column at all times, because of the presence of the company train. If the march is being conducted in the presence of the enemy, however, tactical conditions may prohibit this rotation. Under such conditions, the headquarters units habitually march at the head of the march unit, and elements of the heavy weapons company may be distributed through the column.

Position of officers. Officers march where they can best control the conduct of the march. At least one should march at the tail of each company, troop, or battery.

Eating and drinking. Eating during the progress of the march, except at long halts, is prohibited. Drinking, except water from canteens or containers carried in the trains, is also prohibited. Especial care should be taken that the men do not drink from roadside springs, wells, or streams. The men should be encouraged to drink copiously before the beginning of the march, should be required to start the march with full canteens, and should be cautioned to drink sparingly from canteens during the march. The trained and experienced soldier, except under excessively hot or dusty conditions, will complete the march with water remaining in his canteen. The recruit, unless prevented, will empty his canteen in the first hour.

Halts. (1) *Intervals.* A halt of 15 minutes should be made after the first 45 minutes of marching. Thereafter halts are made for 10 minutes after each 50 minutes of marching. Since small units usually march as parts of larger commands, and as these regulate the time of halts in accordance with the hour of starting of the leading unit, the first halt will usually take place in less than 45 minutes from the hour of starting of units in rear. However, each march unit halts simultaneously, at the prescribed time. Since it is desirable to complete the march as early in the day as practicable, halts longer than 15 minutes are not generally ordered, except that one such may be ordered during the hottest period of the day.

(2) *Conduct at halts.* When a halt is ordered the men fall out along the side of the road, remove and adjust their equipment, relieve themselves, and take advantage of the opportunity to rest. The adjustment of saddles, packs, and harness is examined and corrected if necessary. Good march discipline requires men to remain entirely off the road, on the right, to clear the road surface for traffic.

(3) *Resuming the march.* March units resume the march simultaneously. About one minute before the end of the rest period a warning signal is given by each company, troop, or battery commander. Dismounted men sling their equipment and take their places in ranks. Mounted men mount and take their places in ranks. The drivers and other personnel who are carried on vehicles resume their places. At the command of the march unit commander the entire unit resumes the march.

March discipline. (1) Straggling is strictly prohibited. Men are not permitted to fall out without the authority of an officer. The officer who marches at the tail of each company, troop, or battery examines each member of the organization who desires to fall out, and either gives him a written permit to report to the medical officer at the tail of the main column or requires him to continue the march.

(2) Each unit is kept closed up to the prescribed distance from the unit in front. If proper march discipline is maintained no elongation of the column will result. If for any reason such elongation occurs, that is, should greater than the prescribed distance result, this distance is made up before the unit halts. This naturally results in curtailing the rest periods and should be avoided whenever practicable.

Duties of officers. In addition to the duties of officers specifically mentioned previously they have the following duties:

- (1) Enforce all march regulations mentioned in this paragraph.
- (2) Examine or cause to be examined the backs, shoulders, and hoofs of animals, if any, at intervals during the march.
- (3) Correct improper adjustment of equipment of the men.
- (4) At the end of the day's march examine the feet of dismounted men, make necessary adjustments of shoes and socks, require the men to bathe their feet, and have abrasions and blisters treated by medical personnel.

Occupation of a Bivouac from March Formation. The commander of a force in march or of its march subdivisions may facilitate the entry into bivouac or assembly areas by preliminary instruction of guides. He may direct that guides from subordinate units, such as infantry battalions, proceed rapidly in advance of the column to a point in or near the point of terminating the march. After being shown the area each unit is to occupy they then return to their respective units to guide them directly into the prescribed area. This process eliminates the delay and confusion which may ensue by making these arrangements after units have arrived. Unit signs to guide organizations off roads help to prevent confusion and loss of time.

Time of Terminating Marches. *Night marches* which are executed for secrecy should be completed at least one hour prior to daylight to allow time for troops to conceal themselves against observation from the air.

Daylight marches should be completed at least one hour prior to darkness so that troops may establish themselves in the new bivouac in daylight as a means of reducing confusion.

Large Forces in March. The march of large forces such as the division may be conducted in one column or several columns. The single column is easier to control, but because of the considerable road space which is required the command cannot quickly be deployed for combat upon contact with an enemy. When such contact is possible, and several routes are available for use, forces such as the infantry division and larger units will often march in several columns. The formation used may employ columns moving abreast, columns echeloned to the right (left) rear, or other arrangements considered to be best adapted to the tactical situation. The commander of each column is usually made responsible for its own security to the front and often to an exposed flank. This requires each column to be preceded by an advance guard. The order of march of units in each column should be such that entry into combat is facilitated. This requires that the main body be formed with infantry units in advance and supporting artillery immediately in rear. Trains and other components of the column will be farther in rear.

SECURITY

It is a military axiom that it is unforgivable for a commander to permit his force to be surprised. Surprise results when the onset of the enemy is so sudden that the main body of a force is unable to defend itself on the ground and under conditions of its own choice. Security measures must be taken to protect troops on the march or in bivouac against all hostile capabilities, either by attack from the air, his mechanized units, or other ground forces. Security measures constitute an essential part of all tactical operations, and orders for a march or a bivouac prescribe the measures to be observed. Security is an essential and continuous part of command responsibility.

The close-in protection of troops on the march or in bivouac falls to the infantry, which is often supported by field artillery and augmented by other arms. Troops on the march are protected by advance guards, flank guards, and rear guards as may be necessary. Troops in bivouac are protected by the outpost. The discussion of infantry

in Chapter II, "Tactical Functions of the Arms," presents details of this phase of security. Plate 2 shows the reconnaissance areas surrounding a large force as an aid to security.

Extent of Security Measures. The commander must determine or estimate the hostile capabilities for interference or contact and provide protection against them. In one case he may need to consider only the possibility of air attack. In another he may limit his security measures to raids by mechanized units and air attack. The ultimate case will include protection against action by enemy ground forces as well as mechanized and air threats.

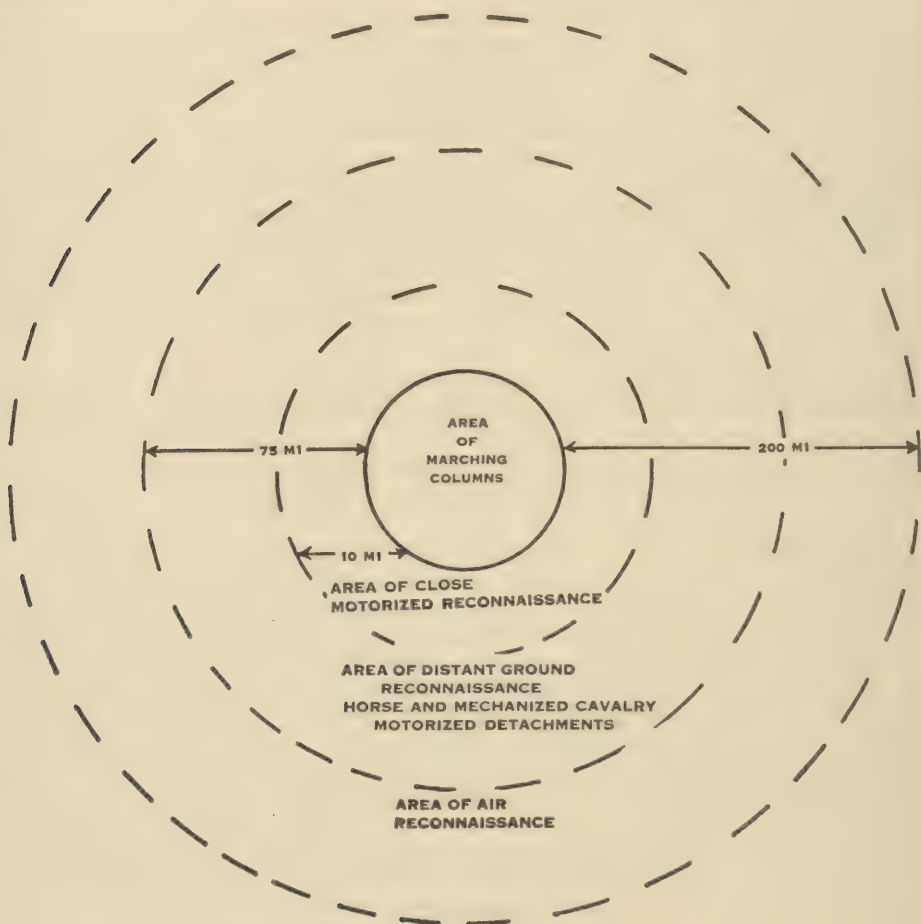


Plate 2. Reconnaissance Areas.

The size of the force is a controlling factor in the distances to the front, flanks, or rear to which units in the service of security will be dispatched. Large forces require a considerable time to develop for combat because of the large front they occupy in battle formation and the intricacy of their supply, communication, and evacuation requirements.

The per cent of a command to which it is reasonable to assign missions in the service of security is subject to very definite limitations. The task is hard, dangerous at times, and fatiguing. The principle is that the bulk of a force is protected within an area in which it is free to move and operate with comparative safety. As a basis of comparison a maximum of one-third of the fighting strength of a force may be used on this mission. Only the number of men actually required should be employed.

General Measures for Maintaining Security. It is useful to think of the measures to provide for the security of a command as consisting of two general functions: first, reconnaissance; and second, the positive measures of attack, defense, or delaying action.

Reconnaissance combined with a *warning service* is conducted to discover the presence of an enemy force so that its capabilities for interference may be estimated. Observation, aviation, mechanized units, horse cavalry, and motorized units of infantry with artillery support may each be utilized independently or in conjunction with one another on this mission. In addition, the advance guard or outpost executes this task in the proximity of the main force. The goal of these security agencies, insofar as it pertains to reconnaissance, is first to discover hostile groups and then to report their presence *in time to permit the commander of the main force to take appropriate action*. A small force such as an infantry battalion may require warning of only a few minutes, if posted and alerted in a defensive position, or an hour or more if in bivouac. A large force, such as a corps, if undeveloped for combat, may require several days' warning. The commander is "surprised" by enemy action unless his freedom of maneuver is maintained and he is able to take full and complete measures of attack or defense prior to the delivery of the hostile blow. The reconnaissance measures instituted must be adequate to gain the extent of warning which is required. For the most part, all units on security missions execute reconnaissance.

The *positive measures* of providing security involve combat. If the hostile force is small, units on security missions may attack to destroy or disperse it. They may defend a key point of terrain which the enemy cannot avoid and attempt to block the hostile action. They may fight a delaying action to reduce the rate of advance of the enemy and thus gain time for the commander to take appropriate action. Delaying action may be executed effectively by relatively small mechanized units, horse cavalry, or motorized detachments of infantry with artillery support; they may not be able to block a determined enemy advance, but regardless of the enemy strength they can harass, impede, and delay him.

Action of Advance, Flank, and Rear Guards on Contact. When any security detachment which is protecting a force in march gains contact with an enemy force it takes immediate and aggressive action in accordance with its mission. The mission assigned to each of these components may vary.

Assume that the advance guard of a column makes sudden contact with an enemy force of unknown strength. The mission of an advance guard, in brief, is to *precede, protect, and clear the way* for the uninterrupted advance of the main body. The way cannot be cleared unless the hostile force is attacked at once and destroyed or driven back. Unless this result is accomplished by the prompt development of the maximum offensive power of the advance guard, the main body may be forced to halt or, if it continues to march, come under the fire of the enemy in route march formation—a highly dangerous procedure. Hence, under these conditions the advance guard must attack, else the advance of the main body will be delayed. Of course, the enemy force may be too strong for successful attack by the small force used in the advance guard. But it attacks, nevertheless, and by this action forces the enemy to disclose his strength, his position, and his intentions so that the commander of the main force may take the action he desires.

The action of flank and rear guards is somewhat different. Their mission is primarily that of protection combined with reconnaissance. If an enemy force makes contact with a flank guard, the action is essentially that of blocking so as to prevent interference with the main body in march. Defensive action, in this case, may satisfy the requirements of the mission.

A rear guard has a mission analogous to that of flank guards in that it seeks to block an enemy from gaining contact with the rear of a force so that it need not halt its movement. Rear guards reach their greatest application in covering a retirement which the enemy may seek to convert to a rout by instituting an aggressive pursuit. Under these conditions the rear guard must block the hostile threat to the main body by executing a series of delaying actions on successive positions. This action involves deployment on a strong defensive position overlooking the route of advance of the enemy toward the

rear of the protected main body. Upon his approach long range fires are directed upon him to force him off the roads, into deployed formations, and to form for an attack. When he has been thus delayed (the main body having gained additional time as well as space), the rear guard withdraws quickly, moves rapidly to a new position, and repeats the process as many times as may be necessary. It cannot defend on one position for to do so would result in being over-run by a strong force, it would be separated from the main body, or the position might be encircled and avoided. A delaying action in successive positions is more in consonance with the nature of the usual rear guard mission.

In all of these illustrations it must be remembered that the power of the enemy may be too great for the security elements to control. Reinforcement of the advance guard, flank, or rear guards may be necessary. In an extreme case the employment of the entire force may result. But if this becomes necessary, the security detachments must gain time for the main force to develop and take up battle formations.

Missions Appropriate to the Separate Arms and Services in the Protection of Marching Columns. Advance guards, flank guards, and rear guards which are constituted from a force of the combined arms are usually formed from two or more of the separate arms and services, depending upon the size of the detachment, the capabilities of the enemy, and the nature of the terrain. Appropriate functions of the separate arms and services in the service of security for marching columns are as follows:

Observation aviation. Observation aviation executes distant reconnaissance to the front and flanks of a large force in march. It seeks to locate large enemy forces, determines their size and components, and observes their movements. It makes a prompt report to other arms on missions of distant reconnaissance, such as cavalry, as well as to the commander. It has no offensive mission since it is not equipped to attack ground troops.

Cavalry. Cavalry is well adapted for the protection of large columns in march. It can operate over a broad front well in advance of the main force. By thorough ground reconnaissance it can search out the hostile forces which may constitute a threat. By the use of its power and mobility it engages in offensive or defensive combat, as the situation may require. It can seize and hold important terrain features until the arrival of the main body or other security elements. It can execute counterreconnaissance to prevent the ground agencies of the enemy from observing the main body.

Motorized infantry. Infantry units may be furnished with motor transportation, or they may have it as organic equipment, so that they may perform missions as described above for cavalry. In fact, they may operate in conjunction with the cavalry or relieve the cavalry on a part of the perimeter of the zone of security. When these detachments are formed they are usually reinforced with heavy weapons of the infantry battalion, truck-drawn light artillery, antitank units, an engineer detachment, tanks if available, a signal detachment, and a medical detachment from the division medical service. It then becomes a strong, self-sustaining force capable of considerable independent action.

Infantry. Columns in march, whether afoot or in motor transport, must be protected with advance guards, flank guards, or rear guards as may be required. The bulk of these units is drawn from the infantry. They provide close-in protection of the columns and protect the columns from aimed small arms fire, as a minimum, and fire from hostile light artillery within effective ranges, as a maximum.

Field artillery. Security detachments, particularly advance guards and rear guards, may have light artillery support. This adds greatly to the available fire power and enables the enemy to be engaged at long ranges.

Engineers. A detachment of combat engineers may accompany security detachments to remove obstructions which may have been prepared by the enemy, assist vehicles over difficult terrain, construct obstacles, and execute demolitions as may be appropriate.

Signal corps. A signal detachment may accompany security detachments, particularly those operating at considerable distances from the main body, so that the commander may be informed promptly of changes in the tactical situation and of the needs of the troops.

Quartermaster corps. The quartermaster component of the division has sufficient motor transportation to provide transport for a battalion of infantry. Motorized detachments will obtain trucks from this source. Supply of quartermaster articles must be continuous, and instances may occur where this is extended to units in the service of security.

Medical troops. A detachment from the division medical service will usually be assigned to accompany units in the service of security to provide for collection and evacuation of casualties.

Bivouacs and Bivouac Areas. Troops halted for periods of several hours or longer **must** be protected against attack or interference by an enemy. During these long halts **troop units occupy bivouac areas.**

The simplest form of bivouac is obtained by halting a marching column, movement off the road into suitable adjacent areas along the route of march, and decentralization to subordinate commanders, such as battalion commanders, of the activities conducted during the halt. This method has the advantage in that all units of a long column halt at the same time; units at the tail are not required to continue marching to close into a prescribed area to the front. When the march is resumed, units take their places with only minor rearrangements in the order of march. The disadvantage of the method is that the area of the bivouac is very deep with the consequent difficulty of control; it is especially undesirable in case of attack by hostile ground forces since the command cannot quickly occupy suitable areas in battle formation. Hence, this form of bivouac is unsuited to the conditions which are to be expected when contact with an enemy is possible.

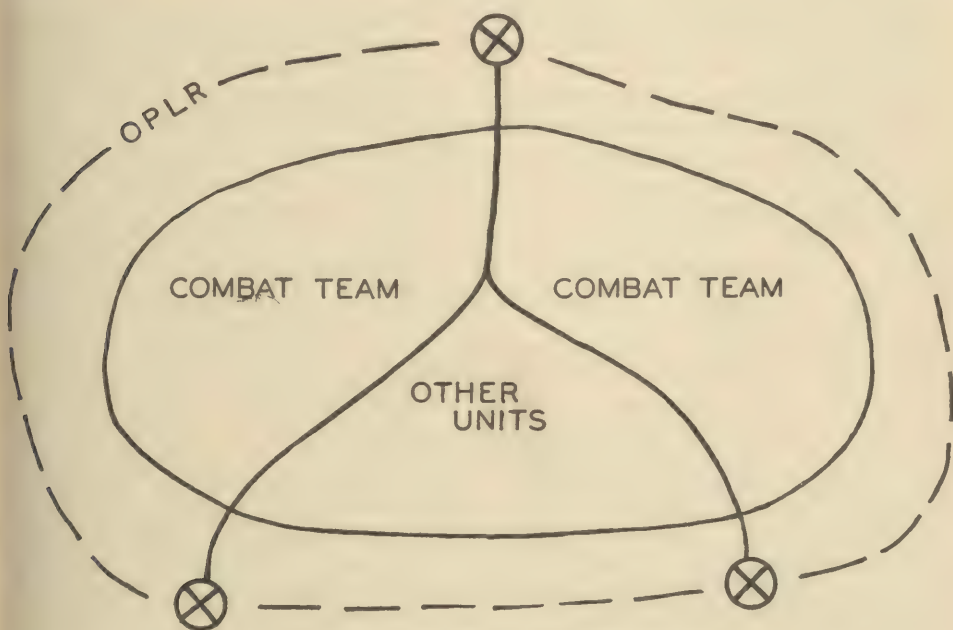


Plate 3. Diagram of a Bivouac Area.

The other form of bivouac consists of closing the columns within an area of suitable size to enclose the entire command. The width of such an area is approximately equal to the front of a force marching in several columns and is therefore somewhat dependent upon the road net. In any event it is wide enough for the force to occupy a defensive position. Its depth is shallower than its width.

A war strength infantry division might occupy a bivouac area 7 miles wide and 4 miles deep.

Plate 3 is a diagrammatic illustration of such an area. Note that infantry-artillery combat teams are placed together in bivouac; this facilitates entry into combat, if that should become necessary, or the resumption of the march in combat teams. Other units of the division are grouped within the area as shown.

The selection of a bivouac area is a function of command. Hostile capabilities must

be considered. The best bivouac area utilizes terrain which has strong defensive possibilities, is adequate in size, has obstacles across its front and flanks, and provides concealment from hostile observation aviation.

Security of Bivouac Areas. Security is provided for units in bivouac under the same guiding principles as for marching columns. Warning of the approach of strong hostile forces must reach the commander of the main force in time to take the measures which are required by the circumstances. The advance of small raiding or reconnaissance parties sent out by an enemy must be blocked so that the main force cannot be observed or suffer interference. See Chapter II.

The distance to the front, flanks, and rear of the bivouac area to which protection should be provided varies in accordance with the size of the command, the hostile capabilities, and the terrain. As a minimum a force in bivouac should be safe from hostile small arms fire; as a maximum it should be free from hostile artillery fires.

Covering and Reconnaissance Forces. A large force in bivouac may be protected by the same covering forces and reconnaissance agencies as described and illustrated for marching columns. In fact, a bivouac of a large unit for a period of several hours may have no appreciable bearing on the action of these forces since they operate at distances which may be equal to several days' march of the unit protected.

Close-in Protection of a Bivouac Area. Just as a force in march protects itself by advance guards, flank guards, or rear guards, as may be required, a force in bivouac provides for its own close-in protection by an outpost, notwithstanding the activities of covering forces consisting of cavalry or motorized infantry. This security measure involves the use of a fraction of the combat strength of a command for the protection of its bulk.

The installation of an outpost system is often decentralized by the commander of an independent force to the commanders of his largest combat teams; in this case the commander will prescribe the sector of responsibility of each main component, the location of the most advanced elements of the outpost, definite points of coordination between adjacent sectors, and special precautions to be observed such as antimechanized and antiaircraft measures. For example, refer again to Plate 3. The commanding officers of the infantry regiments may each be assigned definite sectors of the outpost. The crosses enclosed by circles indicate the exact location of points where coordination is to be obtained. The action to be taken in case of attack is prescribed.

In accordance with these instructions sector commanders assign units of their own forces to form the outpost and appoint an outpost commander. An outpost consists of an outpost line of resistance (OPLR), supports, and reserves. A large outpost may include artillery. Antitank guns are usually included. The troops on the OPL are in small groups, such as a rifle squad, placed on ground with good observation and defensive characteristics. These units may be widely separated, depending upon the visibility to the front and flanks. Areas between these small groups are covered by periodic patrolling, especially at night. Supports are placed in rear of the OPL, so situated that they can move quickly to reinforce any part of the outpost which may be threatened. The reserve of an outpost is held under the control of the outpost commander for use in blocking or counterattacking a hostile force which penetrates the OPLR in order to prevent it from gaining contact with the main force. See "Infantry in Security," Chapter II.

By this method a force protects itself during the periods when it is halted in bivouac. While the main force should be reasonably free from attack, if the hazard is great the position may be organized for defense and the men may rest or sleep in or very close to the actual positions each would occupy in case of attack.

Action of an Outpost When Attacked. When an enemy attempts to penetrate an OPLR, information of the location and strength of the threat must be communicated quickly to the outpost commander. Thereafter, units of the outpost operate in accordance with their prescribed mission. Small raiding parties and patrols should be blocked by fire. If an attack is made in force, prompt reinforcement of these small units may be made to enable resistance to be made in the forward areas. In other cases the units on the OPLR may be directed to fall back when forced to do so to a defensive position. In still others these

small units may have fulfilled their mission merely by giving warning of the hostile approach. The latter would be unusual. Thus the action to be taken by an outpost in case of attack should be definitely established in orders. It may be to defend the OPLR, in which case units should be quickly reinforced; they withdraw only on orders of the outpost commander. It may be to fall back when forced to do so into a defensive position outside of the bivouac area. Or the mere giving of warning followed by withdrawal into the bivouac area may suffice.

Missions Appropriate to the Separate Arms and Services in the Protection of Bivouac Areas. *Observation aviation.* Distant reconnaissance to the front and flanks of the force in bivouac. It makes prompt report of hostile large forces, including their composition, size, and movements, to the other arms on missions of reconnaissance, such as cavalry, and to the commander.

Cavalry. Cavalry, either horse or mechanized, is well adapted for covering force missions. It executes reconnaissance and counterreconnaissance, and engages hostile forces which are advancing toward the main force.

Motorized infantry. Motorized infantry units, reinforced as the situation may require, may perform covering force missions in the same manner as cavalry.

Infantry. The bulk of the units on outpost are drawn from the infantry.

Field artillery. A large outpost will include field artillery. Some units may be placed in position areas outside of the bivouac so that targets may be engaged at long range. Others are placed within the bivouac area and prepared to fire in close support of the OPLR.

Engineers. Engineer units may be used to protect a bivouac area by constructing obstacles, such as road blocks at defiles, and by executing demolitions in areas which will not be required by the future action of the force. For example, flank protection may be increased by destruction of bridges.

Signal corps. The signal component of the force will maintain constant contact with units in the covering force and with the outpost commander so that the force commander may know the tactical situation at all times.

Quartermaster corps. The quartermaster component of the force will supply additional vehicles for tactical missions.

Medical department. Plans must be made to evacuate wounded from the OPLR to the bivouac area in case of attack.

OFFENSIVE COMBAT

Offensive combat is employed to secure a decision over a hostile enemy force with which contact has been gained or can be gained. The winning of a decision, in its ultimate application, requires the destruction or capitulation of the hostile force. The ends may be gained in a lesser degree by the dispersal of the enemy as an organized military force capable of further resistance, or even by forcing his evacuation from an area if that degree of success is in accordance with the assigned mission. Most wars continue until one force gains a complete mastery over the other to a point, at least, where it is obvious that further resistance can result only in destruction and annihilation. Thus, as a principle, decisive results are obtained by the offensive only, insofar as it pertains to winning the victory on the battlefield.

After the initial contact has been gained the commander must make an early decision as to the future action of his force including *what* it is to do, *when*, *where*, and *how* it is to do it. The decision must be followed by a plan for its accomplishment.

If his decision is to attack, it will be *coordinated* or *piecemeal*, a *penetration* or an *envelopment*.

Coordinated Attack. A coordinated attack presumes complete development of the force prior to attack, that each component is in position as the action commences, and the force operates in accordance with a prepared plan as expressed in orders which prescribe a definite objective for the whole force and a definite mission for each of its components. It is in contrast to a piecemeal attack.

Piecemeal Attack. A piecemeal attack is delivered prior to the development of the whole force. Units enter the action successively as soon as each reaches the battle area and without waiting to obtain complete coordination. Shortage of time to make a coordinated attack is the usual factor which requires the piecemeal attack. The assigned mission may require completion within such a limited time that no other form of attack can be executed. Or hostile reinforcements may be able to arrive on a front prior to the time a coordinated attack can be driven home.

Attack by Penetration. An attack by penetration is a frontal attack directed against an enemy in position which seeks first to pierce his position and then to rupture it entirely.

A penetration strikes the enemy where he is known to be prepared to defend, in contrast to an attack by envelopment which seeks to avoid the hostile defenses (see Plate 4).

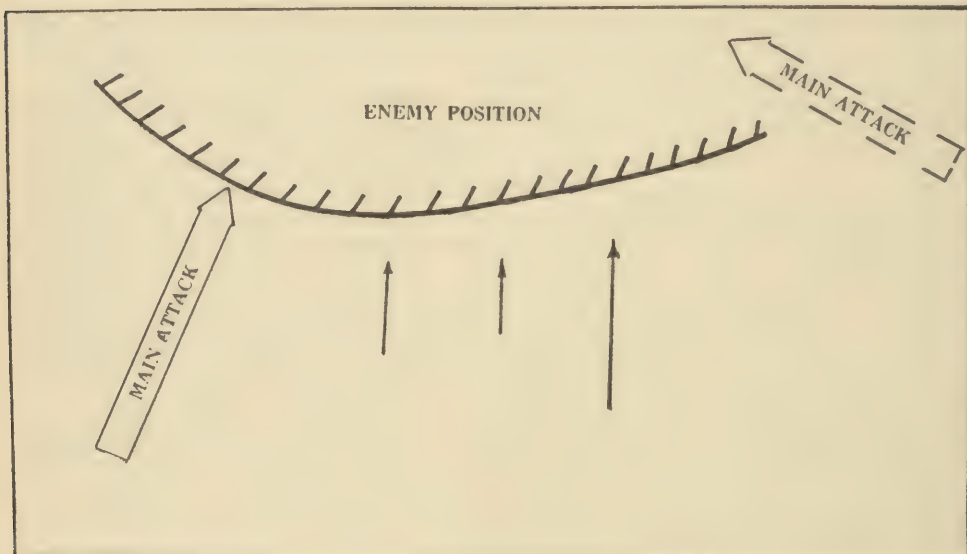


Plate 4. A Penetration and an Envelopment.

Resort must be made to attack by penetration when the enemy occupies a position which offers no flanks for envelopment (obstacles protecting the flanks, protection of units on the flanks, unfavorable terrain), or under conditions where the factors of time and space do not permit attack by envelopment, a more time-consuming procedure.

Resort may also be made to attack by penetration when this form offers the best chance of success. A hostile force in seeking to "defend everywhere" may so over-extend itself or fail to hold adequate reserves as to present a weak front inviting penetration.

Attack by Envelopment. An attack by envelopment consists in attacking *both* the hostile front (holding or secondary attack) and one or both flanks (main or decisive attack).

Attack by envelopment seeks to direct the main attack through an area outside of known hostile organization to an objective behind or on the flank of the enemy position. The flanks and rear of a force are its vulnerable localities. The rear portions of a position contain the command, communication, and supply installations, the supporting artillery, and the formed reserves. Analysis of battles throughout all history indicate that the vast majority of decisive attacks have been envelopments. The Great Captains have each been past masters of the art. The defender will seek to determine the position and location of the main attack so that he may move to block it. He may be deceived and surprised. He may be prevented from taking a desired course of action by the holding attack or the progress of the main attack. Further, attack by envelopment forces the enemy to diverge his fire in two or more directions while the fire of the attacker converges upon him. (See Plate 5).

Attack in a Meeting Engagement. A meeting engagement is a collision between two opposing forces, each of which is more or less unprepared for battle. It may ensue without the collision element when one or both decide to attack without delay, or when one decides to deploy hastily for defense while the other attacks quickly before this defense can be organized. The element of speed is present on the part of both forces, whatever their action.

The initial combat is between covering forces or advance guards. Advance guards may be quickly reinforced, particularly with artillery. Thus the action may flow from combat between covering forces to advance guard action to development and attack by the entire force. (See Plates 6 and 7).

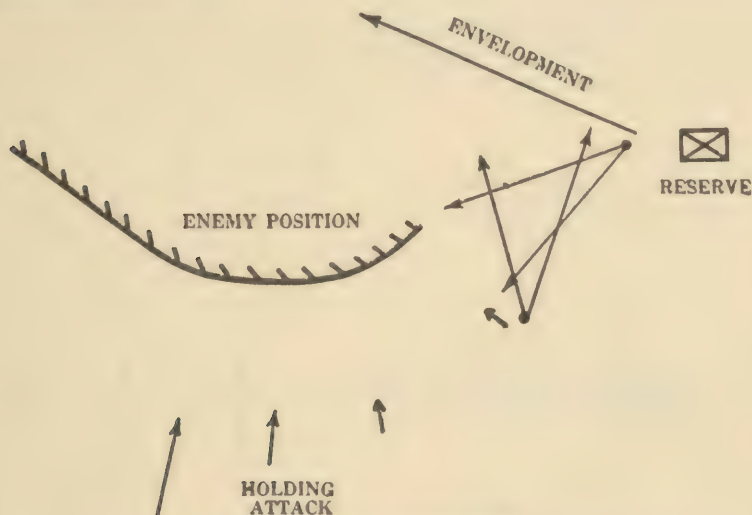


Plate 5. An Envelopment.

While this action is proceeding the commander will decide on his future action by weighing his *mission*, the *tactical situation*, the *terrain*, and his own will, the *will of the commander*.

If he decides to attack he will direct the advance guards to continue their attack to discover the enemy's location, strength, and intentions while he assembles the bulk of the command in an assembly area preparatory to movement to attack positions and launching of the attack.

Attack against an Enemy Deployed for Defense. A hostile force which foresees early contact may deploy for defense at once, occupy positions, and attempt to organize them in order to receive the expected attack. The situation presented is of an enemy who has placed his troop units in defense but has not yet completed the organization of the ground or coordination of defensive fires. Given time he will finish this work. The passage of time favors the defender.

The attacker who discovers this situation will wish to act quickly. Since his enemy is actually on his defensive position a coordinated attack must be made. Speed is a vital factor. Secrecy with rapidity of movement to attack positions may enable him to obtain surprise. It is often difficult to decide on the proper time for an attack. Assume, for example, that an attack can be launched today over fairly suitable terrain, or that by delaying the attack until tomorrow the main attack force can move to more distant attack positions which are ideal. The commander will tend to attack today over the less desirable terrain for to delay will allow the defender to carry his organization more nearly to completion.

Attack against an Organized Position. An enemy in an organized position has occupied a battle position of his own choice, troop units have been placed after careful study to withstand attack from any direction, his defensive fires have been coordinated and the position protected by an outpost and possibly by covering forces. It may be assumed that he has made the most of his opportunities.

Under these conditions the time the attack is made, whether today, tomorrow, or later, becomes a less vital consideration. The enemy may be well able to withstand all but the strongest attack.

Reconnaissance must be made to uncover the hostile main position since it is protected, we may assume, by an outpost and by covering forces. These units must first be driven in. The flanks must be explored, their position fixed, and units in flank protection, such as cavalry, driven back. The main position must be studied to determine its areas of greatest strength and greatest weakness. All this will often be necessary before the decision and plan of attack can be made.

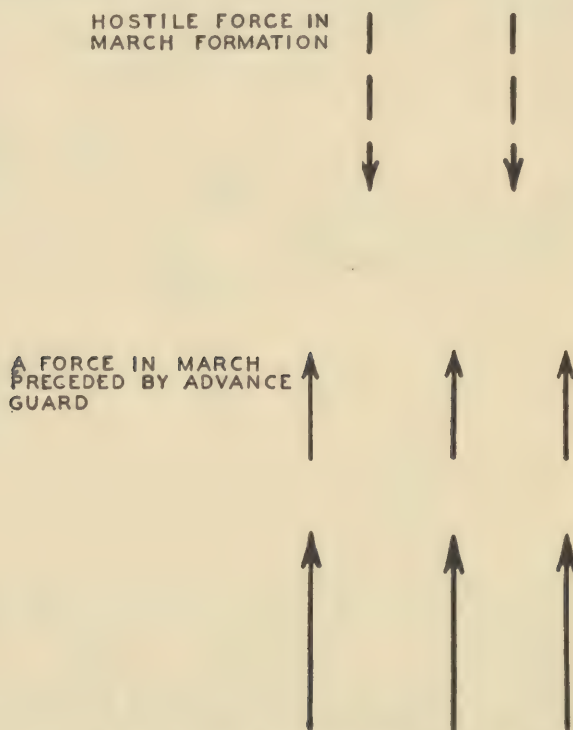


Plate 6. Attack in a Meeting Engagement. Situation Prior to Contact.

It then becomes a matter of concentrating the maximum power of the attacker in the vital area selected. Surprise remains an important advantage to the attacker. The fact that an attack is in preparation may be perfectly apparent. But when the attack will be made, the locality and direction from which it will come, and its intensity will not be disclosed until it is started. Feints, deceptive measures, and secondary attacks will assist the decisive action. It is a power attack in which speed in planning and delivering the blow has a reduced importance.

The task presented may be beyond the powers of the unit planning the action. In such a case reinforcing units as may be available or necessary are attached for the duration of the action. In addition, the support of aviation may be provided. Reinforcing units may include all or a portion of the following: observation aviation, light artillery, medium artillery, antiaircraft artillery, heavy artillery, tanks, and chemical units.

Attack of an organized position presents the most difficult undertaking which may be assigned to attacking troops. Time must be taken to determine the best course of action, to prepare fully, and, if necessary, secure the services of reinforcing units.

Commander's Choice of the Form of Attack. The commander is concerned first of all, with securing a decisive victory in compliance with his mission and, second, with the

accomplishment of his will in the shortest time with minimum casualties. *He will choose the form of attack which, in his judgment, will most surely result in success.*

Effect of the Mission on the Decision. The employment of military forces in battle, whether large or small, involves the prescription by higher authority of a mission. The nature of this mission may be definite in the extreme as, for example, to attack a hostile position at or before a stated time. Or, in other cases, the mission may be general in nature and the commander authorized to take such tactical action as he deems best to carry out the mission. Illustrative of such a condition, the commander may be required to deny the enemy access to a prescribed area; in the execution of this mission he may elect to defend on one position, to fight a delaying action in several positions, or to attack in order to eliminate the hostile force which threatens him. The mission assigned a separate and independent force may consist of several requirements; it may be required to protect a flank of a larger force, to delay the arrival of hostile reinforcements, and to block a hostile advance beyond a definite line.

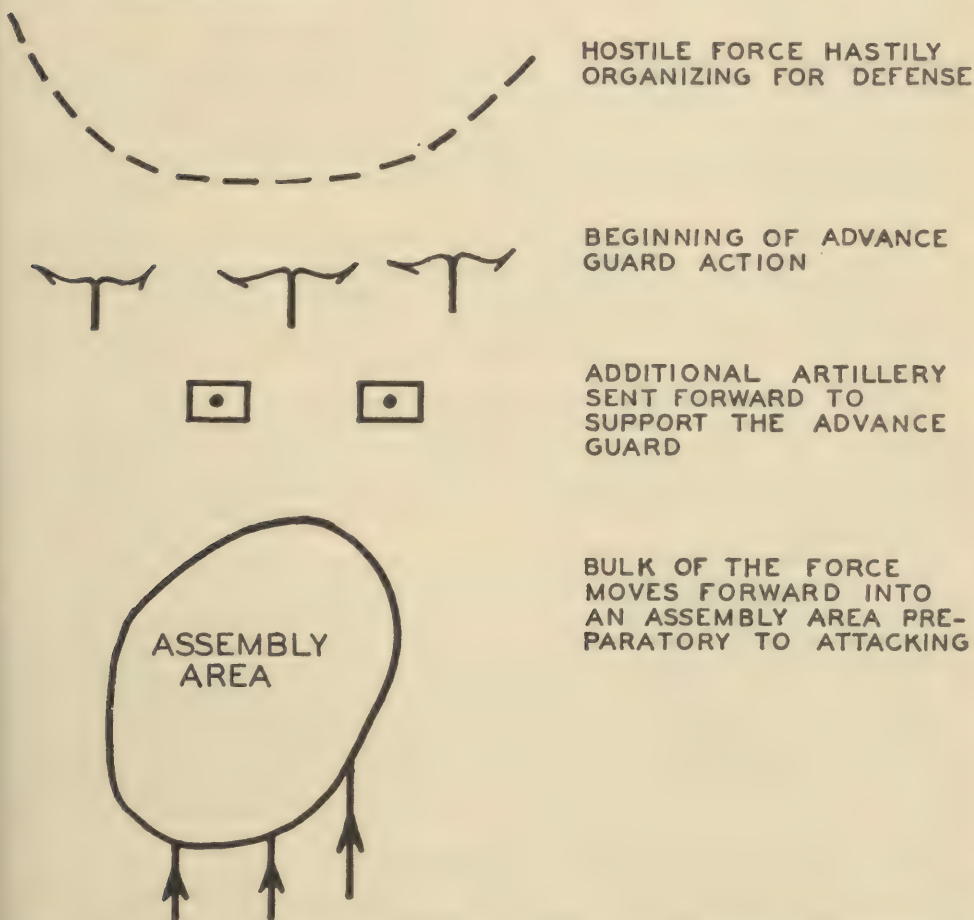


Plate 7. Attack in a Meeting Engagement. Advance Guard Action and Preparations for an Attack.

Whatever the assigned mission, the commander must satisfy its requirements in arriving at his decision. The latitude allowed him may permit the choice between attack, defense, or retirement. Or, the requirement that he attack being clear, he may have freedom of choice as to timing the attack, such as to attack at once, without delay, at a definite time on the same day, the next day, or at a still more deferred time. In still other cases the

direction from which the attack must be made may be included in the requirements of the mission.

Thus it is clear that the conditions which confront a commander with respect to the mission and its accomplishment approach infinity. But there are two principles which remain: *First*, within the limits of the means available to him, including his own resourcefulness, skill, and leadership ability, *he must accomplish his mission*. *Second*, he must make that decision and plan which, in his own judgment, will most surely result in the accomplishment of his mission *in the least time and with the fewest casualties*.

Effect of Terrain on the Decision. Only rarely will the nature of the terrain determine whether the commander should decide to attack or defend. In the usual case that is predicated upon the mission. The nature of the terrain when studied in connection with the enemy's known position and organization will determine *where* the main attack will be made. By choice of the best terrain over which to make the advance the commander seeks to reduce the hazards of the main attack force while increasing the difficulties of the defender.

Unfavorable terrain is flat, open country dominated by higher ground occupied by the enemy who must be defeated if the objective is to be reached. Movement in such areas forfeits the vital factor of surprise, exposes the attacker to observation and to aimed fire of all weapons within range. Such routes of advance are usually accompanied by lack of suitable locations from which to observe and adjust the fires of supporting artillery as well as the heavy weapons of infantry. Where there is a choice, avoid areas which can be swept by aimed hostile fire.

Favorable terrain, on the other hand, provides at least a measure of concealment from hostile observation, protection from his aimed fire, and points of elevation—hills—from which the fire of his own supporting weapons may be observed and adjusted. Vegetation such as woods or scattered patches of trees provides concealment. The best protection from aimed fire is dirt—hill masses or ridges separating the zone of advance from the known hostile position.

The attacker seeks a corridor leading into or towards the objective. A stream valley is a corridor. To be suitable its width must be sufficient to accommodate the frontage of the attacking unit. A corridor serves as a useful check on the maintenance of direction during the advance. When the attacker can retain control of the high ground overlooking the corridor he is able to exclude aimed fires into the flanks of the assault units, a vital factor in a successful attack.

Selection of terrain is a matter of the utmost importance. But *use* of the terrain over which the advance must be made is also a vital factor. Subordinate units will rarely have the choice of the areas of their advance. They must make the best use of whatever ground is allotted to them. This involves selection of routes by subordinate leaders, such as squad and platoon leaders, avoiding areas of greatest danger; the use of formations which reduce the vulnerability of the unit, such as small columns at wide intervals; crawling, if need be, to advance without exposure around or over exposed terrain; crossing of shallow, exposed areas at a run. The commander of the force does his part by selecting the best area over which to direct the attack. But this must be accompanied by skill and resourcefulness in the use of ground by subordinate leaders if the benefits of this selection are not to be nullified.

Plan of Attack. The decision to attack will include its form and objective and is accompanied or followed by a plan of attack or scheme of maneuver. The plan will provide a mission for each component of the force, the sum of which is intended to secure the decision.

Included in the plan will be the designation of the units to execute the *holding or secondary attack*, the units to execute the *main or decisive attack*, as well as the units to be placed in *reserve*. All attacks include provision for these elements with the area in which each is to operate, their mission, their timing and coordination.

Holding Attack. The holding or secondary attack seeks to fix to the ground the enemy opposed to it and to attract hostile reserves to its front. Success of the main attack often depends upon the skill and aggressiveness with which it is conducted.

In a meeting engagement the troops in the advance guard, in part at least, will often make the holding attack. After contact is made pressure against the hostile force is maintained by fire action or by fire and movement. If he weakens his position to move troops to other locations the gaps will be exploited. As a further aid to the main attack force, a *principal effort* is launched in conjunction with the decisive attack or in advance of its delivery. This is a strong attack supported by artillery and is directed towards a definite objective somewhat shallower than the objective of the main attack.

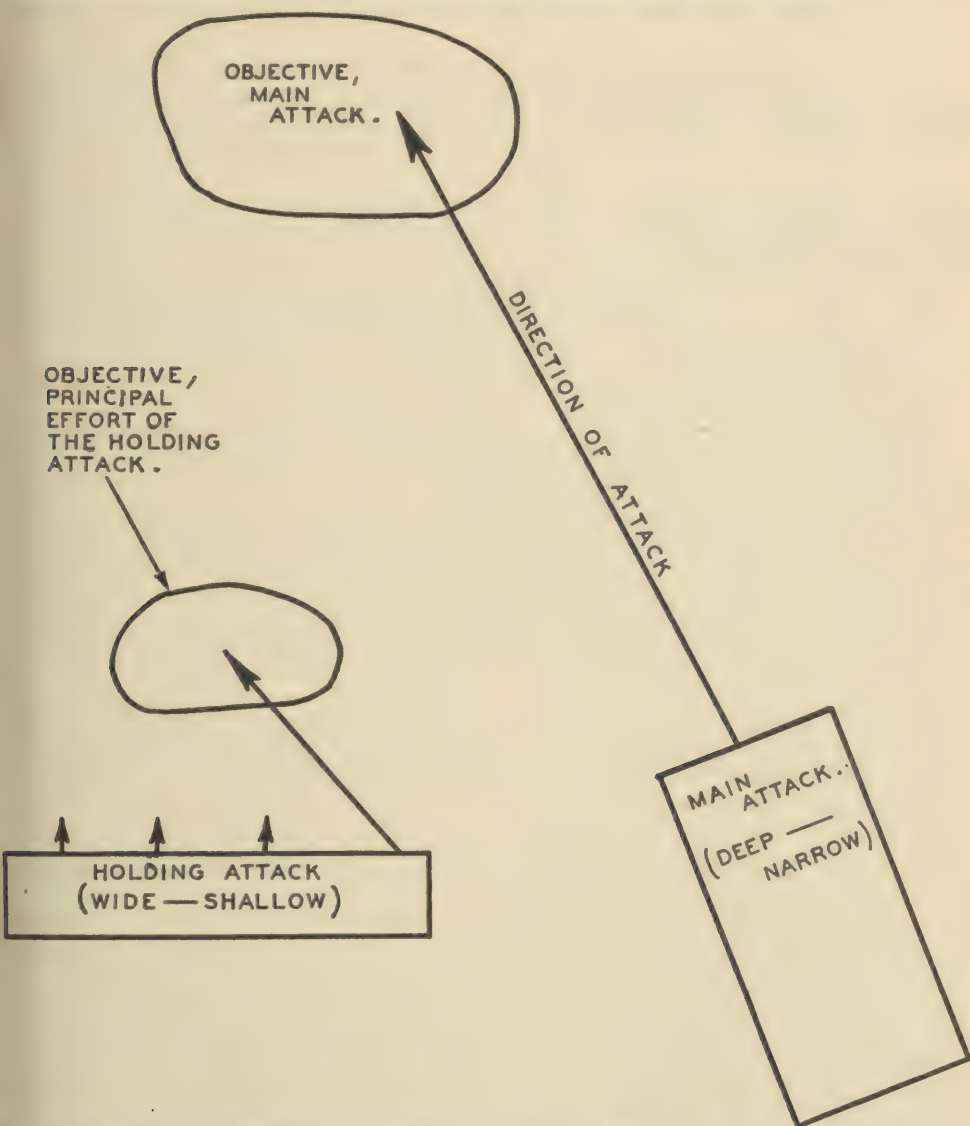


Plate 8. Diagram of Holding and Main Attack Forces Showing Formations and Depth of Objectives.

The importance of the holding attack in its effect upon the outcome is too often minimized in practice as well as in study. It is very important. In some ways it requires a greater skill than the delivery of the main attack which, after all, is allotted the bulk of the means. Its action is partly deception and partly power. It is not a weak attack. Units attack on a wide front and in shallow depth; in this way they develop their

maximum power quickly. By attacking on a wide front the depth of their attainable objectives is reduced. It is poor reasoning which leads to a decision to assign a mission obviously beyond the capability of a force to accomplish. The element of deception which is introduced is to make it easier for the enemy to draw erroneous conclusions, a startlingly easy matter on the battlefield.

Aggressive conduct of the holding attack will aid the main attack by confusing the enemy as to the location of the decisive area and by holding in position his troops which have been engaged. If the element of deception succeeds, his reserves may be directed to this front.

The strength of the force making the holding attack is usually a minor fraction of the infantry component. In no case should it be stronger than that required for the assigned mission. The bulk of the infantry must be saved for the decisive attack. However, it should be provided with strong artillery support. The remaining combat elements, except one or more battalions in division reserve, would then be available to make the main attack. Further, the holding attack is stripped to the minimum strength commensurate with its mission in order that the bulk of the force may be available for the decisive effort. (See Plate 8).

Main Attack. The main attack is planned to be decisive, to win the victory. It is given the bulk (more than half) of the means available to the commander. It seeks to strike the enemy where he is least able to resist effectively. It seeks to mass a superior force against the enemy *in the area of the attack* in order to drive rapidly to an objective from which the destruction of the hostile force may be completed.

Surprise is an important factor in its success. The massing of units to make the attack must be so executed that the enemy will receive the attack before he can move to meet it or before he can prepare completely to meet it.

It has been pointed out that the holding attack is delivered in shallow depth and great width so that the maximum strength can be developed quickly. The forward movement of the main attack force is on a narrow front and in great depth so that continuity of action may be maintained. As one unit encounters resistance, is blocked, or suffers heavy casualties, a new and fresh unit passes through and continues the forward movement or maneuvers around the resistance to continue the advance. A series of strong blows may then be struck in a manner which will be the most effective.

The goal is to concentrate in an area a greater power than the enemy can bring to bear against it. Past experience indicates that time and again the application of this principle has attained the victory, even permitting weaker forces to defeat the stronger.

Coordination. Arrangements must be made by the commander to provide for coordination of effort between the components of his force.

Infantry. Attacking infantry units within adjacent areas require coordination of the time of their advance, the direction, objective, and the zone within which each is free to maneuver. This is obtained by prescribing a line of departure, a time to leave this line, right and left boundaries (flank units do not require an exterior boundary), and a definite objective. (See Chapter II, Infantry.)

Artillery. Coordination is required between artillery units, and between artillery and supported infantry. Each artillery battalion is given a definite sector of responsibility within the limits of its range and instructions as to firing restrictions. Battalions are then placed in position areas so that all parts of the battle area may be covered with adequate supporting fires. Contingent zones may be assigned to each battalion equivalent to an overlap of the areas of responsibility of adjacent battalions within which they are to be prepared to fire on call in support of adjacent units. Coordination with the supported infantry units is obtained by liaison detachments, personal contact, and observation.

Coordination between Subordinate Commanders and Staff Officers. A vexing phase of operations in the field is the oft-repeated selection by one commander of an area for his use which, all unknown to him, has been selected by another for a conflicting purpose. For example, Hill 106 may be selected as a position for machine guns, as an artillery observation post, and as a location for antitank guns; or the defiladed area in rear of the hill may be

chosen for a command post, an aid station, and as an ammunition distributing point. Unit commanders and staff officers making these selections must adjust these matters, foresee and avoid them, and be ready to accept a prompt give-and-take to the end that all necessary establishments are able to occupy suitable localities with speed and precision. In practice, able commanders and staff officers adjust these conflicts as a matter of course.

Movement of Troop Units Prior to Launching the Attack. Prior to the actual delivery of an attack the troop units, particularly of the main attack force, must move to attack positions. Reconnaissance must be completed, orders issued, and coordination of the entire effort obtained.

This movement involves occupation of an assembly position close to the line of departure, followed by movement to the line of departure in time to start the attack in correct formation at the prescribed time. The movement must be screened from hostile ground observation and protected from interference. Very often it will be completed at night.

Conduct of an Attack. Assault units execute the several phases of attack, including the approach march, the fire fight, the assault, and continuation of the attack aided by the supporting fires of infantry heavy weapons and artillery. The techniques employed by infantry and field artillery in attack are discussed in sufficient detail for the purposes of this volume in Chapter II, "Tactical Functions of the Arms."

Use of Reserves. "Victory is to him," said Napoleon, "who can put in the last reserve."

It is never possible to foresee exactly how an attack will progress, how the enemy will react, the emergencies which may arise, or the opportunities which may be presented for exploitation. For these reasons a commander will retain a portion of his infantry strength in reserve during the initial stages of the action. He will use this force at the time and in the manner which he decides will have the greatest effect upon the outcome of the battle. Such uses may include the following: the blocking of a hostile counterattack, relief of a unit which has spent its force in action, extension of an envelopment to reach the objective, or the exploitation of a success by initiating prompt pursuit.

Subordinate commanders retain a portion of their infantry strength in reserve for similar reasons. The commander of the holding attack will require a unit of suitable size with which to deliver his principal effort. The commander of the main attack will employ a narrow front with a portion of his force while placing the remainder in depth. Similarly, assault battalions of infantry may place one or two companies in reserve; a rifle company might hold one or two platoons in reserve. In principle, the smaller units will tend toward early use of their reserve. The commander of the force will wish to retain control of his reserve until the decisive opportunity for its employment is presented. In open warfare, the use of motor transport permits the prompt engagement of reserve units at distant points.

Missions Appropriate to the Separate Arms and Services during the Attack. *Air force.* Attack of ground objectives which will be of direct assistance to the attacking troops. Protection of the attacking troops against hostile aviation. (See Chapter II.)

Observation aviation. The execution of reconnaissance missions, missions for infantry and artillery, and command missions incident to control and communication.

Cavalry. Cavalry units attached to an infantry division or corps are available for use in reconnaissance and counterreconnaissance, development of the hostile position including the driving in of his covering forces and uncovering of his flanks. During the attack they may be used to protect the exposed flanks of the attacking troops, to delay the arrival of hostile reinforcements which can reach the battle area before the attack is driven home, and they may be used in the decisive phase of an attack for action, particularly against the hostile flanks and rear. After a successful attack cavalry may be used in exploitation.

Infantry. Infantry units, supported by field artillery, will make the holding attack and the main attack. Following a successful attack they will execute the exploitation in conjunction with other units.

Field artillery. Light artillery will operate in direct support of designated infantry units, in the usual case. Close contact will be maintained between the artillery unit

commander and the commander of the unit supported. Liaison detachments are provided so that fires may be delivered as desired by assault battalions of infantry. Medium artillery operates, for the most part, in support of the light artillery by engaging targets beyond the range or power of light artillery or by increasing the intensity of its fires. Counterbattery fires are executed by medium artillery to neutralize or destroy hostile artillery units whose positions are discovered. An essential part of artillery action is its flexibility and range; it may mass its fires within a wide and deep area, by employing its long range, so that a large portion of a front may be engaged.

Combat engineers. Combat engineer units may be directed to stand prepared to assemble at a designated point within a time limit in order to engage in combat.

Signal corps. Units of the signal corps, such as the signal company of an infantry division, establish and operate the message center of the command, install and operate signal communication facilities to the headquarters of the principal subordinate components and attached units.

Antiaircraft artillery. Antiaircraft artillery provides an area defense of installations, troop units, and localities as directed by the commander. Appropriate missions include the protection of the main attack force against air attack, protection of reserve units, the division command post, the railhead, and distributing points. The mission may include protection of essential areas on the line of communications such as bridges, railway junctions, and vital highway intersections or defiles.

Quartermaster corps. The quartermaster corps obtains and distributes supplies which are common to two or more arms and services. It provides the stockage of supplies incident to an extensive operation. Its tables of organization include a limited number of laborers to load and unload supplies at the railhead and distributing points.

Ordnance department. The ordnance component of a field force is responsible for the delivery of small arms ammunition, and for the repair and replacement of motor transportation and many items of ordnance equipment.

The medical department. Regiments of infantry and artillery are provided with medical detachments which function under the direct control of the unit commanders. This personnel operates the aid stations, provides company aid men, and assembles the casualties at aid stations where they are prepared for evacuation by the division medical service. The infantry division has a medical battalion. This personnel is additional to the medical detachments of organizations and operates under the control of the division commander. It establishes collecting stations and evacuates the casualties from battalion aid stations into these installations. From these points the casualties are evacuated by ambulance to the division clearing station.

The Force Commander during an Attack. The commander of a field force is responsible for all that his unit does or fails to do. Through his staff he will obtain information of the enemy upon which to base his future action. He will make the decision and announce the plan by which it is to be accomplished. His staff will be utilized to complete the details of this plan with respect to each of its many phases. When the completed plan is approved they will disseminate it to subordinate commanders.

After the commander has announced his decision and plan he may visit his principal subordinate commanders to discuss with them the projected operation and make any minor readjustments which this discussion may develop. He should seize each opportunity to visit the subordinate commanders and the troops in order that he may see their operations *and be seen by the troops*.

He will confer with the chief of staff from time to time to apprise him of supplementary decisions and inform himself of the progress of the operation as received at the command post.

He will plan the future action of the force, seeking to foresee and prepare for all possible developments.

He will determine the time, place and mission for the use of his reserve.

The commander of a field force should use to the utmost the capabilities of his staff

and his subordinate commanders. But he is responsible for the decision and the supervision of its execution.

PURSUIT

Purpose. Pursuit must follow closely a decisive victory. It contemplates the destruction of the hostile force, for only in this way are the full fruits of victory to be attained. A defeated enemy who is allowed to retire after breaking contact will be able to reorganize, obtain reinforcements, replenish his supplies, and restore his morale. Thereafter he may again take the field. A defeated force in retreat is demoralized and disorganized. Prompt and vigorous pursuit by all of a commander's resources, despite fatigue and hardship, may result in the delivery of the final crushing blow which will bring hostilities to an end. Campaigns are won by the destruction, dispersal, or capitulation of the enemy, not merely by the attainment of a local tactical advantage.

Time to Initiate Pursuit. The timing of the start of a pursuit is a difficult command decision. Overconfidence leading to a premature conclusion that the hostile force is definitely defeated may lead to a serious reverse. When the enemy is decisively defeated pursuit is launched. This state is indicated by the capture of critical objectives, the diminution of resistance, reports from front line units of the capture of prisoners, the abandonment of weapons, the cessation of hostile countermeasures. Reports from observation aviation should indicate the attempt to form march columns or movement away from the area of combat, the movement of trains to the rear. These items are indications. The commander must consider the actual information which reaches him as verified by his own observation, and when the instant arrives when he is convinced of the enemy attempt to retire he should order the pursuit to start. If he has foreseen this opportunity he will have issued warning orders to the troops so that the launching of the pursuit may proceed without delay.

Method of Executing Pursuit. The technique of launching a pursuit consists of applying *direct pressure* against the front of the defeated force with the early dispatch of *encircling forces* around one or both flanks to intercept and block the hostile retirement. When this situation is gained the two components of the pursuing force complete the destruction of the enemy.

The forces in direct pressure consist of the units in contact with the hostile front. They continue their advance, seeking to overrun the remaining hostile resistance, prevent his reorganization, defeat his covering forces, and prevent the formation of his march columns. The commander will usually decentralize this operation, assigning distant objectives and zones of advance to his principal subordinate commanders. Relentless, continuous pressure is required without regard to hardship, fatigue, or weather for the same factors will beset the enemy. This action continues until the retirement has been blocked by the encircling maneuver whereupon the final destruction of the hostile force is completed or his capitulation obtained.

Encircling forces are constituted quickly from available units and dispatched over a route outside the area of hostile resistance to an area in his rear, there to block his continued retirement by seizing important objectives such as bridges, mountain passes, or strong defensive terrain.

Components of the Force in Direct Pressure. The force in direct pressure includes all elements of the command, less the units assigned to form the encircling forces.

Components of a Force in an Encircling Maneuver. The encircling force must be able to move with speed and be strong in fire power. As it will be separated, perhaps by many miles, from the main force it must be capable of a reasonable degree of sustained action.

Bombardment aviation. Bombardment aviation may provide a decisive blow by attacking hostile groups and prevent an orderly retirement.

Observation aviation. Observation aviation can provide the vital information concerning activities in the hostile rear areas, the location of formed columns, and their direction of march. This information is of vital importance in the conduct of the encirclement.

Mechanized units. Mechanized units, when available, are especially suitable for encircling maneuver since the characteristics of their vehicles coincide with the requirements.

Cavalry. Horse cavalry is well adapted for the purpose since it possesses mobility and fire power to move in force at a rapid rate to vital positions in rear of the retiring columns.

Motorized infantry. Infantry units assigned encirclement missions will be taken from the general reserve since they are usually the most available. They will be provided with motor transportation so that they may move in a motorized column.

Truck-drawn light artillery. The power, long range, and mobility of truck-drawn light artillery make it highly important in an encircling force.

Antiaircraft artillery. An enemy will employ his every resource to avoid encirclement, including attack by his aviation. While the column is en route in march column it requires this protection.

Antimechanized units. An enemy provided with mechanized vehicles may be expected to use them to intercept the encircling forces. Antitank guns are needed to attack such forces.

Engineers. A detachment of combat engineers should accompany the encircling force to assist motor elements over difficult terrain, to execute demolitions, and construct obstacles.

Chemical units. The attachment of chemical units to an encircling force provides a means of employing chemical ammunition.

Signal troops. A detachment of signal troops, or other communication personnel, is required. Communication may be restricted to use of the radio.

Medical personnel. A provisional medical detachment should accompany the force to provide for the collection, treatment, and evacuation of casualties.

Summary. While it is altogether unlikely that a commander would have all of the units listed above he will select from the forces available to him suitable components for the mission. He will then appoint a commander and issue instructions, including a definite mission.

Conduct of the Encirclement. The orders to form an encircling force will include the point of its assembly or points where units will join the column. The march objective of such a column will be an area in rear of the retiring columns from which further operations will be conducted in accordance with the situation which is found to exist after arrival. The route of the force will be outside of the area of expected hostile interference so that arrival at the objective may not be delayed. Since an encircling force must operate independently it provides its own security measures.

After arrival at the march objective, information must be obtained of the location of hostile columns and their direction of march. Observation aviation and the reconnaissance vehicles of cavalry are especially suited for this purpose. With the delivery of this information the commander of the encircling force will then select and occupy areas where he can best block the hostile retirement. Upon the approach of the enemy he will cause them to be engaged by long range artillery and machine gun fires in order to slow their rate of movement. The position occupied will be held in order to permit the forces in direct pressure to close in and complete the victory.

DEFENSIVE COMBAT

Introduction. The purpose of this section is to define the essential phases of the defense with special reference to units of the combined arms. It is an integral part of campaign. Throughout long periods of action along an extended front, defensive operations will obtain during far longer periods than the offensive. Ability to present a defended front so strong as to be impregnable to quick penetration permits the commander to strip men and guns from many areas and assemble them in another. When this has been accomplished he may strike a decisive blow with strong forces, secure in the knowledge that other parts of the area of contact, perhaps lightly held, will be able to withstand attack.

The defense serves to prevent the enemy from gaining the decision, denies him entrance into certain areas, or weakens the enemy by imposing casualties so as to increase

the possibility of a successful counteroffensive against him. Specifically, the purposes of the defense are as follows:

(1) To gain time, pending the development of more favorable conditions for undertaking the offensive; for example, through the arrival of expected reinforcements or supplies, or through better weather conditions.

(2) To economize troops, and to avoid going into battle at a time when, or place where, a decision is not sought, so that as large a force as possible can be held out for a main offensive effort at another place and time.

(3) To keep the enemy out of territory that has tactical, strategic, or political importance, in order to reduce the freedom with which he can maneuver his forces.

There are distinct tactical advantages which lie with the defense. The defender may often choose the ground on which he will meet the enemy. He may then organize his position by selecting the most suitable areas, by field works, by construction of obstacles, by coordination of defensive fires, by the preparation of plans to meet each hostile capability. Communication between the elements of the command is simplified, a vital aid to control.

But there are also important disadvantages. He has forfeited the initiative to the attacker. He cannot know exactly when, where, or in what strength the enemy may attack. There is a hazard in that a long defense may lower the morale of the troops. They may lose confidence in their own offensive powers. They may forget that the real goal of battle is the destruction of the enemy force, not merely to delay the time when a more aggressive enemy may impose his will upon them. On the battlefield decisive results are to be obtained only by the offensive.

Types of Defense. There are but two types of defensive operations. They are differentiated only by the purposes for which the defensive attitude was adopted.

The *passive defense* seeks only to hold a specified area against hostile attacks. The mission of the force may be fully accomplished by blocking action. Counterattacks launched in a passive defense are to eject a hostile force which has entered the position or to counter a threat to the position.

The *counteroffensive* on the other hand, foresees the delivery of a strong attack to gain a decision. Ultimate offensive action is the primary consideration. The force may take a defensive position or action which serves to invite attack. By concealing reserves, or by ability to move reinforcements into the area by rapid means of transport, it may deceive the enemy as to the available strength. Then, after the enemy has developed his force for attack and partially fixed his dispositions, the counteroffensive will be struck with all the power, speed, and surprise of which the erstwhile defender is capable. It is an offensive growing out of a defense, even from a delaying action. Unlike the usual offensive action which seeks to strike an enemy where he is weakest, it seeks to attract strong forces to a desired front, even to invite an attack, and then, when the enemy has placed himself in positions and formations unsuited for defense, to strike the decisive blow. The overly aggressive commander who is prone to minimize or fail to determine hostile capabilities is liable to encounter disaster from such action.

Selection of the Defensive Position. The commander will wish to choose the strongest ground on which to base his defense. His selection will be determined by consideration of the requirements of his mission and the size of the force available to him. Never an easy task, he will make his decision after consideration of the possibilities of protection of his flanks and front by natural obstacles; of fields of fire for his infantry; of observation for his artillery to provide for the adjustment of their fires; of concealment behind the battle position of his mobile reserves and his artillery; of depth of the position so that a local success on the main line of resistance will not rupture the position. Finally, he must be quite certain that the enemy cannot avoid the position to a degree, at least, which would prevent the defender from making dispositions and countermeasures to block his advance.

An interior unit, part of a larger force, will occupy and organize for defense the area allotted or prescribed.

An independent force has far greater freedom of choice and accepts greater hazards.

The latter are increased by lack of obstacles to protect the flanks, by absence of dominant terrain, and by a variety of approaches to the position. Flat, open country or gently rolling terrain reduces many of the advantages which otherwise may accrue to the defender.

Lacking obstacles to protect the flanks, an independent force will tend to "refuse" its flanks; that is, they will be bent back so that an envelopment will not pass the position so readily. Reserves from behind the battle position may extend the flanks to present a continuous front to a hostile enveloping attack.

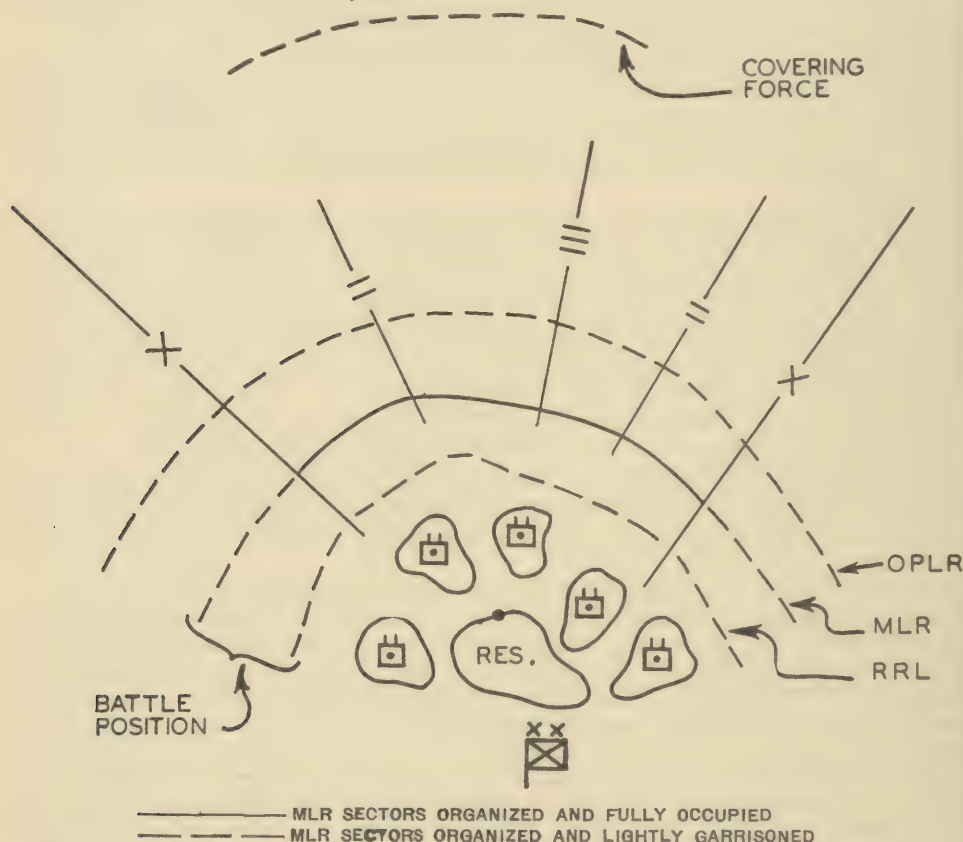


Plate 9. Diagram of a Division in Defense of a Position with Exposed Flanks.

A useful procedure in selecting a battle position is to locate, first, the regimental reserve line, the rearmost part of the battle position. This should be placed somewhat in advance of the dominant observation of the area in order to protect it. The main line of resistance is then located with respect to important terrain localities, elevations which afford good observation and are called "keypoints"; it will be located to provide a depth of the battle position varying from about one-half mile to one mile. The commander will wish to occupy these strong positions and to defend with fire alone the areas which lie between them. Analysis will then be made of the corridors leading into the position, particularly those which lead toward the key localities, for the enemy may be expected to exploit these avenues of approach. When this study has been completed the commander is ready to decide the portion of his force to be committed to the battle position initially, the "keypoints" each is to occupy, organize, and defend, and the units to be held in reserve. In making these assignments to positions he will assign definite sectors of responsibility.

A force of the combined arms, occupying a position with flanks exposed, requires

strong reserves to meet and block any hostile threat which may arise. As a basis for further study of a particular situation, the reserve should include from one-third to one-half the total infantry strength available. Other units (but never artillery) may be held in reserve. This reserve will be used to block the hostile main attack or to launch a decisive counterattack. Its use in dribbles to strengthen hard-pressed units on the battle position would be exceptional. Each subordinate unit assigned to the battle position will also have a reserve component; these units are available to block local penetrations, to make local counterattacks, or they may be withdrawn to constitute a portion of the general reserve.

Plate 9 (not drawn to scale) illustrates the framework of a defensive position with exposed flanks. It shows the battle position, sectors assigned to subordinate units, placement of reserves, artillery battalion position areas, and the location of the command post. It is schematic only and without reference to any terrain or type of terrain. Each defensive position must be developed after analysis of the mission, the situation, and the actual terrain available for organization.

Organization of the Position. Organization of a position includes the initial deployment of the force into the assigned positions and the completion of preparations to resist sudden attack if such action is a hostile capability. This having been accomplished, entrenchments are dug, gun emplacements completed for infantry heavy weapons, camouflage prepared, and definite areas of responsibility for supporting weapons assigned, including lateral coordination with adjacent units. The plan of artillery fires is completed, firing data computed, and coordination obtained with the infantry supporting weapons. Plans are then made for the conduct of the defense to meet each of the several avenues of approach open to the enemy. Obstacles, demolitions, dummy works, observation posts, and communication trenches complete the defensive organization.

As soon as the initial organization has been completed it is safe to hold the position with a reduced garrison of many key points. Accordingly, two, three, or perhaps four battalion sectors on the "nose" of the battle position are fully occupied and a few lightly garrisoned; the remainder may be unoccupied except for personnel in observation. Units which are not held within the battle position are located in reserve, some to be released to subordinate commanders when a threat develops; a strong force, such as a complete brigade, is retained by the commander for use during the conduct of the defense.

There is virtually no end to the organization of a position. As soon as the immediate requirements of the battle position are satisfied, organization of positions extending the flanks will be instituted. The depth of the position may then be increased so that if withdrawal becomes necessary because of enemy action the force may occupy new positions in rear and continue the defense.

The health and comfort of the troops are important when a defensive position is to be held for an extended period. Drainage of trenches, sanitary arrangements, and provisions for shelter to allow men to obtain normal rest are among the important considerations.

Conduct of the Passive Defense. The defender of the position with open flanks, the most dangerous condition which can confront him, must be prepared to repel a frontal attack, check enveloping attacks, and prevent dangerous movements around the flanks. Such a defense is relatively more mobile than the defense with flanks secure. This demonstrates the reason for committing fewer troops to the position and the holding of strong reserves.

The defender must endeavor by all available means to discover the enemy's intentions and the time and place of his attack.

Upon the approach of an enemy he should be engaged by long range artillery fires; for this fire, positions may be occupied in advance of the battle position. These may be followed by fires from infantry weapons. Therefore, when the approach of an enemy can be observed he must advance in the face of defensive fires in addition to overcoming the resistance of natural and artificial obstacles, demolitions, covering forces, if employed, and local security detachments in advance of the battle position. Since assembly areas are usually occupied under the protection of darkness, defensive fires must be delivered from data previously computed. These are schedule fires which can be delivered on call.

A strong attack may be delayed or disorganized by this action, but it is not to be expected that it can be stopped prior to contact along the main line of resistance. These positions should be held and local penetrations by the enemy quickly counterattacked by units held for the purpose in each battalion sector or by units from the regimental reserve line.

The general reserve (or reserve held by the commander of the force) must be retained until the location of the hostile main attack is definitely disclosed. It may then be used to extend the flanks of the position to meet an envelopment, or to counterattack to restore that part of the battle position which has been seized by the enemy. Premature use of this reserve renders the commander unable to meet further developments which may be decisive. When it is engaged a new reserve should be constituted from units on the battle position which are not under hostile pressure. The defense of a position in open warfare with exposed flanks requires the utmost flexibility, strong reserves, prepared plans, and unerring judgment in estimating the hostile threats. The hostile main attack must be met squarely with strong forces.

Conduct of the Counteroffensive. The initial phases of the counteroffensive may be entirely identical with the passive defense. In the one the mission is accomplished merely by denying the enemy the accomplishment of his goal. In the other a sudden shift from the defense to the offense is planned in order to inflict a decisive defeat upon an enemy. It may be regarded as a trap in which an enemy may be ensnared. By definition, the counteroffensive is contemplated when the defensive is assumed. The preservation of a large, intact reserve with which to launch the attack is a requisite.

Alluring as this form of attack may seem, and successful as it may have been in past instances, it requires the utmost in advance planning, exact timing in its delivery, and a skillful, cool, and resolute commander to carry it off. Surprise is vital to success.

The ideal time and situation for launching the counterblow is when the attacker has exhausted his forces in the offensive and has consumed his reserves. If the enemy has committed a tactical error, the counterblow should strike before the mistake can be corrected. If the enemy separates his attacking forces widely the counterblow may be directed against one of his elements while containing the other.

Once the counteroffensive is under way, the execution is the same as in an attack.

Missions Appropriate to the Separate Arms and Services during the Defense. *Air force.* Attack of ground objectives in direct support of the defending troops. Protection of the ground forces from attack by hostile aviation. (See Chapter II.)

Observation aviation. The execution of reconnaissance missions, missions for infantry and artillery, and tasks for the commander incident to control and communication.

Cavalry. Prior to the launching of an attack by a hostile force against the defended position, cavalry units may be utilized as covering forces in protection of the front or flanks of the battle position. During the conduct of a defense, cavalry may be employed on special missions or be held in reserve.

Infantry. Motorized infantry units may be employed in advance of the battle position as a covering force. Small infantry detachments may be placed in advance of the battle position to constitute the outpost. Within the battle position infantry units will be assigned sectors for defense or hold positions on the regimental reserve line. Infantry units which are not utilized on the battle position or in the covering forces are held in rear of the battle position as a mobile reserve.

Field artillery. The artillery is held "in readiness" or it supports the defense of the battle position by performing direct support missions for designated infantry units or general support missions for the force as a whole. No artillery is held in reserve. Artillery is placed in readiness when its best location cannot be definitely foreseen. In this case, some of the light artillery may be placed in a central location where the road net favors movement to the front or either flank; from this position it will be prepared to move on call to occupy any one of several previously prepared positions as soon as the hostile threat has developed.

Position areas for artillery are so located that fire can be delivered well to the front and flanks to engage an approaching enemy force at long range. It will be emplaced to cover the front and flanks of the battle position with special reference to favorable corridors of

approach. Firing data will be computed so that fire may be massed in specified areas, particularly in the protection of exposed flanks. Depth is provided by placement of battalions, some being placed sufficiently far to the rear to enable fire to be delivered in support of the regimental reserve line.

Coordination is obtained by prescribing lines which are to be reached by units and by prescribing the lateral limits of fire. Contingent missions may be assigned which permit artillery firing in support of a particular unit to switch its fire to assist artillery units on its flanks.

Combat engineers. Combat engineers are used to execute demolitions and construct obstacles to delay the hostile approach. They may be employed to lay out a battle position and construct certain of its works. During the conduct of the defense they may be assembled in reserve to be available for combat as required.

Other units. Defensive operations provide no special tasks for the remaining arms and the services. They continue to perform their usual functions.

Summary. The above discussion may be summarized as follows:

Defense doctrine. A defense position is organized:

- (1) In depth,
To guard certain keypoints,
With only portions (tactical localities or defensive areas) of the position occupied, with the intervals covered by fire alone.
- (2) So that the enemy:
Blocked in his front by tactical localities,
Is forced into intervals,
Where he is held by obstacles, and
Taken under further fire from the flanks.
- (3) With the result that the attacker,
Suffers heavy casualties,
Loses cohesion and control,
Is finally brought to a halt,
And is ejected by a counterattack.

Influence of terrain on the plan of defense. (1) A plan of defense of a sector is prepared after consideration of the following:

The mission
Width and depth of the sector
Strength of units
Supporting fires available
Analysis of terrain

(2) An analysis of terrain takes into consideration:

(a) *Terrain in general.* Corridors leading up to and into the position. Cover, concealment, fields of fire, observation, natural obstacles, routes of communication.

(b) *Influence on the defense.* Keypoints within the sector; the selection of weak parts and strong parts of the position.

(c) *Influence on the attack.* Terrain features within the defensive area the capture of which will further the enemy attack—the area through which the enemy will probably make his strongest attack.

Conduct of the Defense. The defense is conducted so as to:

- (1) Disorganize the attack in its preparatory stage.
- (2) Stop the attack by fire in front of the battle position.
- (3) Repulse the assault by close combat if the attack reaches the battle position.
- (4) If the enemy succeeds in entering the battle position to attempt first to subject him to such an intense, coordinated fire of all available arms that he will be forced to withdraw; and this failing, to eject him by counterattack, so that the end of the battle will find the position entirely in the hands of the defender.

We say, therefore, that there might be three phases in the development of defensive combat, viz:

- (1) Defense against enemy preparations for attack of the battle position.
- (2) The exterior defense of the battle position.
- (3) The interior defense of the battle position.

The defense, to effect its purpose and to meet the different phases of defensive combat, provides for full and effective employment of coordinated fire power by all arms, and for movement as well, to meet developments in the defensive battle.

The system of fire consists of:

- (1) Long range artillery fire in localities well forward of the battle position.
- (2) The combined fire of artillery and infantry weapons in localities in front of the battle position.
- (3) The fire of infantry weapons alone in localities close to the battle position.
- (4) The combined fire of artillery and infantry weapons within the battle position.

WITHDRAWAL FROM ACTION

Purpose. A *withdrawal from action* is an operation by which all or part of a deployed force executes a breaking of contact with an enemy, particularly an enemy which is attacking or pressing an advantage, in order to initiate some other action. It is classified as a retrograde movement (movement away from an enemy), and as a defensive maneuver. The immediate purpose may be to rescue a command from a desperate situation, or to break off an engagement which has already accomplished its purpose or which appears to offer no further chance of success. It seeks to put space between the opposing forces. After contact has been broken the withdrawing force may execute a retirement, occupy a new position for defense, or execute delaying action in successive positions.

Classification as to Time of Execution. Withdrawals from action are classified as *night withdrawals* or *day withdrawals*, depending upon the time at which they are initiated.

A *night withdrawal* is the preferable method when the commander is free to choose. The movement may be concealed by darkness so that the force may be well started on its next maneuver under the protection of adequate covering and security forces before the enemy discovers the withdrawal. A force in withdrawal is particularly vulnerable until its next operation is well organized and started. The commander of a hard-pressed force will prefer to hold his positions until nightfall rather than risk the hazards of daylight withdrawal unless to do so will entail a very definite chance of decisive defeat.

A *daylight withdrawal* must usually be executed in the face of serious enemy pressure. An aggressive enemy upon discovering the rearward movement will seek to convert an orderly withdrawal into a rout, bending his every effort to block its execution. Cavalry, however, may employ this maneuver with greater safety than a force which includes a large infantry component, especially a cavalry force withdrawing before infantry. Their greater mobility will gain the space and time so badly needed for the clean breaking of contact.

Execution of a Night Withdrawal. Orders for a withdrawal from action at night must be issued sufficiently in advance of darkness to permit reconnaissance, planning, and issue of orders by subordinate commanders. Success of the maneuver may hinge upon secrecy. The arrival of daylight must find it completed and the next operation well under way. Speed may be achieved only by orderly movement and the maximum use of the best routes, with the avoidance of the mishaps which cause delay, confusion, or discovery.

A *covering shell* protects a night withdrawal. A small fraction of each unit in contact, such as units from infantry and artillery battalions, remains in position until an hour or two before daylight. These units accelerate their firing and activity in order to conceal the departure of the bulk of the force. Under the protection of this shell the bulk of the force completes its withdrawal. A logical order of withdrawal is: service units and installations, artillery, infantry. At the designated time the units in the covering shell assemble, move quickly to prescribed assembly areas, and effect their own withdrawal aided, if practicable, by motor transport to overtake the main force. Dawn should find the position empty and contact completely severed.

Execution of a Daylight Withdrawal. Orders for a daylight withdrawal must be issued sufficiently in advance of the start of the maneuver to insure understanding and coordi-

nation within all units. Under hostile pressure, the sight of large units moving to the rear may induce others, whose duty is to remain, to start back unless they have been informed of the plan. Such movements when started are difficult to control. There is no military maneuver which requires a higher degree of discipline of all ranks, or greater capacity for leadership, than a daylight withdrawal executed under strong hostile pressure.

Protection is provided by covering forces which operate quite differently than the covering shell described above. In the one case stealth, concealment, and deception are relied upon. But for the other, speed of withdrawal combined with the power of covering forces to hold off pursuit must furnish the protection.

Service units and a portion of the artillery must clear the area before infantry units in contact can be withdrawn. At the proper time, upon order, these infantry units break contact by moving straight to the rear, fighting their way back if need be, under the protection of *local covering forces* placed in position by subordinate commanders for the protection of their own units. A situation which often develops, in practice, is that the most hotly pressed units must be the very last to break contact; for them to withdraw too soon may expose the entire force to envelopment, leading to destruction. During the withdrawal no unit may be permitted to expose the flank of another. The arrival of the shield of darkness is often necessary before the organization for the next operation can be completed.

General covering forces, designated by the force commander, are formed from the general infantry reserve with suitable attachments of artillery, and such special units as cavalry, tanks, chemical units, engineers, or antiaircraft artillery. They are formed from units which are available to the commander and are constituted so as to be able to cope with the requirements of the mission assigned. Unlike the covering shell which remains in place to cover a night withdrawal, these units are placed on commanding ground in the rear or on the flanks of the withdrawing units, not on their front, since under the circumstances of a daylight withdrawal under pressure such positions cannot be occupied. They prepare to block pursuit by fire action delivered particularly at hostile units which threaten the flanks. Long range artillery and infantry heavy weapons fires are employed. This fire action is to force the enemy to forego action against the main force and divert his attack to the general covering force or forces in order that the bulk of the command may move with minimum interference. The covering force may counterattack, defend on a single position, or execute delaying action in successive positions, whichever will be the most effective in accomplishing the mission.

Under the protection of the general covering force the ensuing action is started. If march columns are to be formed, as will often be the case following a successful breaking of contact during daylight, a rear guard and flank guards must be formed to provide close-in security.

Once contact has been severed the hostile advance must be impeded by all practicable means. In addition to the action of covering forces the use of demolitions to destroy bridges and roads, the placing of contact mines, and erection of obstacles will each be desirable. These are functions of combat engineers.

The very nature of the conditions inherent to a daylight withdrawal indicates that a commander free to choose will prefer to initiate the movement under the protection of darkness. But where the enemy attack is driving hard upon its objectives, and decisive defeat is a definite expectancy if the hostile advance cannot be blocked or evaded, the commander may be forced to accept the hazards of daylight withdrawal in order to preserve his command. It is a difficult decision. Its orderly execution requires time, careful planning, precise orders. If delayed too long the chance of withdrawal may become forfeit. In that event defeat may become the inevitable consequence.

DELAYING ACTION

Purpose. *Delaying action* is an operation executed in order to prevent the uninterrupted advance of a hostile force. It seeks to gain time without fighting decisive engagements. The extent of the delay which must be obtained is often definitely announced by prescribing that the enemy must be held beyond a definite line or terrain locality until a certain date and hour. The maneuver may be employed in order to prevent hostile troops from reaching the area of the main forces in contact; a commander may resort to delaying action on a

portion of a front, in preference to defense of a single position, in order to mass a strong force within a restricted area to launch a decisive attack. Since a strong delaying action may be fought by weaker forces than are required for defense, the commander may elect to cede a minimum of territory so that stronger forces may be assembled in a decisive area.

The Factors of Time and Space. The factors of time and space, tyrannical considerations in all military operations, have special importance in delaying action. How much territory may be given up? How long must the enemy be prevented from reaching a definite position? The nature of the action is governed by answers to these questions and an analysis of the terrain. The conditions are infinite, but a study of time and space will enable reasonable conclusions to be reached.

Assume that a hostile force can be intercepted at a certain point, and that it is to be prevented from reaching a line in rear of the point until a definite day and hour. First, determine the time the enemy can reach the prohibited line if his advance is uninterrupted. This will give at once the extent of the delay which must be exacted. Having determined the factor of time, the commander will consider the space available to him through which he is free to maneuver, and the nature of the terrain on which he is to effect delay. If the space is short he may be forced to secure the total amount of delay from a single position, as one extreme, in which case his action is purely one of defense until the mission is accomplished. But if the space is deep he may utilize a number of delaying positions in order to obtain the delay which is required.

This analysis having been completed the commander will formulate his decision and plan. If the delay is to be accomplished in successive positions he will make tentative selections of terrain localities before the operation commences. He will wish to occupy strong terrain, which the enemy cannot avoid, with good observation and long fields of fire. Since he contemplates withdrawal from each delaying position, suitable routes of withdrawal will be factors in his choice.

Conduct of Delaying Action. The initial delaying position, at least, having been selected, the force will be moved into the position, formed for combat, and the organization of the position started. Delay in advance of the initial delaying position should be obtained in order to force the enemy to deploy and take action to discover the position. This, in itself, obtains time. It is executed by detachments, preferably those with fire power and mobility, which move forward and engage the enemy with long range fires. Further delay is obtained by harrassing action against the hostile flanks; this may be secured by motorized infantry with artillery support or by cavalry. As soon as the enemy comes within range of the troops on the delaying position he is engaged by fire. This should force him off roads, into deployed formations and assembly areas. The position may be held until he forms for attack, even until his attack is well started. Infantry will prefer to hold a delaying position until darkness, then execute a withdrawal from action and occupy a new position in which to obtain delay during the next day. Cavalry, however, is more free to execute daylight withdrawals.

Thus the action is continued. The hostile force must be impeded to obtain the required delay, or the maximum delay if no definite time limit is prescribed. The delaying force must avoid becoming decisively engaged for to do so may result in destruction with failure to accomplish the mission.

Small forces are able to delay large and strong ones. The frontage assigned units may be much larger than would be occupied in defense of a position. The time for starting a withdrawal must be closely controlled by the commander. The new position must be designated in advance and known to all. Reconnaissance for routes to the new position and positions to be occupied by each unit should be reconnoitered prior to movement. The necessary arrangements for control and coordination having been made, the actual execution of the withdrawal is properly decentralized to subordinate commanders.

Hostile motor movements around the flanks are especially dangerous. Units with equal mobility which can move to block an envelopment are necessary. Demolitions may be employed to retard enemy movements by motor. Road blocks may be installed over a wide front to prevent hostile movements by motor at night. If the situation is obscure large reserves must be held to meet threats as they develop.

The commander of a delaying force must act promptly and surely in the execution of a mission with infinite possibilities. He must obtain information of enemy movements promptly in order to move to block them. Confronted, as he will be, by stronger forces, he must be alert to every opportunity to obtain delay and avoid every hazard as it develops.

RETIREMENT

Definition and Purpose. A *retirement* is a movement away from an enemy, a retrograde movement, in which a force seeks to regain freedom of action. Such a movement, to be a true retirement, must be part of a well-defined plan which has for its purpose the refusal of decisive combat in an area under the conditions which obtain at the time. The terms *retirement* and *retreat* are similar in meaning. A hostile retirement, for psychological reasons, may be referred to as a retreat. A logical distinction is that a force making a retreat is unable to retain freedom of action or choice, and the movement is conducted under such pressure that interruption of the movement may result in decisive defeat. A *rout* may develop after a decisive defeat or the failure to effect an orderly retirement. Units begin to disintegrate; control diminishes and may become non-existent. Panic may ensue. Lee retired after Gettysburg; Napoleon retreated from Moscow, but despite his losses one can hardly say that his force was routed; at Tannenberg many Russian units were routed. It is often a nice distinction. It should be clear that in a retirement the operation must be planned, control must be retained, security measures must be observed and maintained; the enemy must be prevented from regaining contact until the time and place have been reached where the commander is once again willing to resume contact under conditions of his own choice.

Conduct of a Retirement. A force in contact with an enemy will necessarily execute a withdrawal from action, in order to sever contact, before the retirement can be started. Once this contact has been broken and the force has moved beyond the zone of effective hostile artillery fire, road march formations may be taken.

The commander must prescribe a march objective and announce the route to be followed, the number of columns and their composition. He must provide continuous and adequate security measures to protect his command.

The security measures which are necessary will certainly include a rear guard; in the usual case a large force will require covering forces and flank guards. Covering forces, if employed, must intercept and delay hostile units which seek to strike the flanks or block the retirement by encircling action. They are especially necessary against hostile motorized or mechanized units.

Demolitions are useful in protecting a retirement. The destruction of bridges, culverts, road intersections, and rail facilities will delay pursuit. Obstacles erected on roads, especially those which include contact mines, should be employed; they are especially important in blocking hostile movements by motor at night.

The retirement must be conducted in such a manner that the enemy cannot regain contact, or seriously delay the operation, until an area is reached or conditions developed where the commander is again willing to make a stand under conditions of his own choice.

OPERATIONS AT RIVER LINES

Importance. Throughout all history river lines have exerted an important influence on military operations. Wide and unfordable rivers are obstacles in attack and natural lines of resistance for defensive and delaying action. Provided the bridges are held or destroyed rivers constitute a useful screen which serve to reduce the extent of hostile reconnaissance. Rivers provide important protection for surprise raids by hostile armored forces. The medical officer serving with troop units will find useful a knowledge of the tactics involved in attack or defense of river lines because the problems involved present special difficulties.

Reconnaissance. The strength of a river line increases with the width and depth of the stream and the velocity of the current. Other important factors are the approaches to the river (road net and possibility of cross country movement), tribu-

taries to the river, presence of fords, nature of the bottom, topography on opposite bank, and the possibility of ice floes, freshets, and floods. Illustrative of this latter possibility was the experience of the Army of Northern Virginia after Gettysburg, in July, 1863, when Lee's defeated army was forced to delay its return over the Potomac for one week because of summer rains. Streams of little significance, appearing perhaps as a thin blue line on a map, may become formidable obstacles after hard rains. Streams with steep, soft banks, or soft bottoms may constitute serious obstacles to armored or motorized units. The phase of reconnaissance must be thorough in any operation along river lines.

Attack of River Lines. A skillful leader will seek a crossing of an important river in an area where he may be unopposed. Reconnaissance, swift movements, and surprise are necessary to achieve such a happy result when confronted by an aggressive enemy. Aerial reconnaissance is especially necessary. Oddly, military history contains many examples of such occurrences and the fall of France was hastened in the judgment of many students of the phenomena by failure to present adequate defense of crossings including instances of failure to destroy important bridges. The alert commander will exploit such opportunities to the utmost.

When the enemy is in possession of the river line, and his defenses cannot be turned or avoided, a crossing must be forced. Thorough reconnaissance, a carefully prepared plan, assembly of the required equipment, superiority in the air, followed by bold, swift action are necessary for success. Seizure of bridges before they are destroyed is sought.

The force making the crossing will often be divided into two or more elements to force a crossing, and a reserve. There may be several determined attacks at separated localities. They will be accompanied by feints and other artifices to increase the chance of deception. The area of the most successful crossing will be exploited, often by using the reserve,

The initial action may be executed by parachute troops quickly followed by airborne troops.

The covering forces are sent across the river in motor boats, the several initial crossings coordinated as to time. The immediate purpose is to secure a "toehold" on the opposite bank to protect the crossing of the remainder of the command. The initial units to cross, usually infantry and combat engineers, will strive to seize a position from which they may protect the crossing area from small arms fire. Following as quickly as the situation permits will be other units including field artillery and armored units, especially tanks, if available. The second goal or objective is to seize positions which will protect the crossing area from ground observed artillery fire, or a "foothold." At the earliest appropriate time platoon bridges may be constructed to facilitate the crossing of heavy equipment. The third objective is selected so as to eliminate all artillery fire from the crossings, or "elbow-room." When such a position has been gained, the further action continues with minimum effect caused by the river. The attacker has then gained a "bridgehead." Success depends upon surprise and speed of execution. A few moments may mark the difference between success and failure.

Means of crossing include small boats, usually called assault boats; rafts or ferries, footbridges, ponton bridges.

Defense of River Lines. The commander must insure the complete destruction of all bridges and fords before the arrival of the attacker. When large forces are available for the defense, the river bank positions may be held in strength and the river be used as an obstacle in front of the main line of resistance. The commander who chooses this form of defense with weak forces should encounter defeat. He will either attempt to defend everywhere and be weak everywhere, or so concentrate his forces that they may be readily avoided. However, when the strength to do so is available maximum resistance may be developed by this procedure.

In cases where wide fronts must be held, the following procedure offers best chance for successful resistance. The river line is held with relatively weak detachments for

the purpose of reconnaissance, warning, and initial resistance. These units may be regarded as patrols with combat missions. Stronger detachments with local reserves are located at the most probable points of crossing or, strength permitting, at the possible points of crossing. For it must not be forgotten that a good tactician will prefer to undertake a crossing with hard physical obstacles provided he can avoid hostile defensive fires during the critical stage of the action. In the Battle of Quebec, for example, the Plains of Abraham were reached by scaling a vertical cliff. However, it is the mission of these detachments to force the enemy to disclose his strength, his supporting fires, and prevent hostile troops from becoming established in bridge-head positions before the arrival and attack of the defender's general reserve.

The defender using this type of defense should hold a strong, mobile reserve. When the commander has determined the area of the main crossing or crossings, he will be expected to launch a counter-offensive to destroy the attacker before he has established himself across the river. Efficient reconnaissance, accurate information, and a cool head for the commander are essentials. Action delayed too long may enable the enemy to cross in such strength that his defeat is impossible. Action started too soon may find the crossing a feint, and the main force of the enemy to have crossed elsewhere.

MOUNTAIN OPERATIONS

Characteristics. Success of operations in mountains depends upon correct equipment, including clothing, and individual training. Military operations have been conducted in mountains successfully throughout all history. Analysis should indicate that mobility is reduced, movement is restricted, firepower and fire effect are reduced, and signal communication and supply are more difficult. Certain regions are inaccessible. Road nets are usually limited, and key terrain features take on great importance. Tactics and technique must be adapted to these special conditions. There are obvious advantages to the defender, but the effect of surprise which is available to the attacker takes added importance since the defender cannot move so promptly to meet an unexpected movement. Again, the defender cannot be strong everywhere, and when the attacker finds the weak spots he will exploit that knowledge.

Sudden changes of weather are serious considerations and the effect of these conditions may be decisive. Special equipment, especially individual equipment, is necessary in order to be prepared for these hazards.

Conduct of Operations. Tactical operations in mountains are characterized by small units operating independently on a coordinated plan. Infantry is the basic arm. It must rely to a greater extent than operations in open country upon its own weapons for support. Weapons of flat trajectory, as one example, find their usefulness greatly reduced. Mortars and howitzers are of increased importance. Combat engineers are vital to the success of operations in mountains. Demolitions of bridges, and hence repair of bridges, are of a greater significance.

Offensive action will often be directed down one or several valleys or terrain corridors which lead in the direction of the objective. The advance of the German forces in Norway should be recalled. The commander must decide which of his avenues of advance shall constitute his main attack. His reserve will be placed to facilitate this advance. The objective will often be a locality which will improve communications and lateral movement between elements of his force. Small groups with light equipment may make encirclements to seize critical points in rear of the hostile force. The success of the Greeks in opposing the Army of Italy is noteworthy in this maneuver. In winter, ski troops reach high effectiveness in mountain operations.

Defense within mountains is often based around control of heights and defiles. Successful defense requires an excellent information and intelligence service because movement to block an unexpected advance may be difficult or impossible. The attacker will seek to find and use routes unknown to the enemy, or considered impassable by the enemy. Hard physical obstacles are much to be preferred to hostile fire.

The defender can be expected to make maximum use of demolitions and their effect

in mountains may be far greater than in open country. Demolitions covered by defensive fires constitute extremely serious causes for delay. Long fields of fire will be sought, and with the ease of concealment available in mountains the task of the defense is lightened.

JUNGLE WARFARE

Difficulties. Jungles offer their own difficulties to a war of movement. However, the speed with which the Japanese advanced against the British defenders of the Malay Peninsula indicates that they do not constitute impassable obstacles. Few roads may be expected, and often they may be poorly constructed and narrow. Trails may be numerous. Direction is hard to maintain and control is difficult. Air observation decreases in importance, and ground observation is limited. Heat, tropical rains, insects, and unhealthful conditions add to the difficulties. It may be the hardest form of warfare from the viewpoint of the individual.

Special equipment, clothing, and training are essentials. Jungle fighting is largely by infantry. There may be little opportunity to use vehicles, and shoulder weapons or weapons which can be hand-carried reach their highest application. Pack transport is essential and is an excellent form of transportation when motor vehicles lose their effectiveness. Supplies must be moved close to the troops. In fact, the individual should be his own source of supplies for long periods of time.

Conduct of Operations. Trail improvement is a constant problem. Leading men in each column should cut the trail. Men following should widen it as they advance. By rotation of the men in the lead the physical strain is distributed.

Reconnaissance is difficult and advancing units invite ambush. Small patrols must be utilized for security. Alertness pays added dividends in the jungles.

While a knowledge of map reading may be of little avail in dense jungles, an understanding of terrain may prove to be of vital importance. The main features of terrain must be identified and understood. A drainage net will be present, and there will be ridge lines, however difficult they may be to locate and follow. The compass will be useful, but dense vegetation and short field of vision makes difficult its use. It is easy to become lost in the jungle and all methods of maintaining orientation and location should be used as a check one against the other. No jungle is so dense that there will not be occasional open spaces or clearings. These must be exploited for contact with friendly aviation including dropping of supplies and messages.

Small units highly trained in jungle warfare, with individuals thoroughly acclimatized, well equipped, and informed of hostile methods of attack and defense are necessary to obtain success in these operations.

DESERT WARFARE

Difficulties. While deserts vary widely in their characteristics, their nature gives them points of similarity. Movement is effected by the changing nature of the surface. Loose sand and sand dunes make movement of marching men or motor vehicles very difficult. On the other hand, in areas where the surface is firm, movement may be simplified and the direction of maneuver become infinite. Well-defined roads will be few because the difficulties of living will support only a sparse population. The climatic condition which creates deserts results in acute shortage of water. Therefore desert warfare is characterized by the dependence of movement and operations upon water supplies. Operations generally are based on the capture and protection of vital water sources. Defeat may be a direct result of destruction or loss of water supplies and water sources.

Visibility may be exceptional except during sand storms when it may become almost nonexistent. Long fields of fire and maximum effectiveness of weapons is characteristic. Daylight movement may be difficult to conceal and troops may be especially vulnerable to air attack.

Conduct of Engagements. Troops operating in deserts should have a high degree of mobility. The operations in North Africa constitute a series of military epics which military students will analyze for years to come. Armored units reach their greatest

effectiveness, notwithstanding the difficulties they encounter in service. Equipment designed especially for the conditions to be encountered is essential. Victory turns to defeat with disconcerting swiftness in desert warfare and the margin between them is slender.

Armored, motorized, and air units should combine in desert operations. By whatever method of organization it is achieved, there must be complete coordination between the several components. The cover of darkness must be exploited for tactical movements to achieve surprise. Night attacks are to be expected. Salvage operations and repair of damaged vehicles and tanks will be conducted at night. Supplies will be moved at night.

Wide envelopments or turning movements are to be expected in desert operations. Since each force is dependent upon maintaining its supply lines, encirclements to sever routes of communication and destroy supply bases are frequent.

Dispersion must be employed to increase safety. Concealment may be difficult, especially for bodies of troops, or trains.

Air power reaches a degree of importance so great that its lack should spell certain defeat. It is used constantly in reconnaissance to detect enveloping or encircling movements. It is used to locate hostile concentrations of troops, and supply bases. Movement of supply trains may be detected. With this information combat aviation may launch attacks with more than usual chance of devastating effect. Air superiority enables the attacker to move with maximum chance of surprise action.

ANTIAIRCRAFT DEFENSE

Definition and Purpose. Ground troops are concerned with the execution of security measures to counteract the effects of hostile attack from the air to insure that they may carry out their primary ground missions. An understanding of these security measures is especially important to the commander of medical units. Their hazards are essentially equal to those of other units which operate within the combat zone, and they are not provided with weapons with which to conduct a defense. Medical units must rely upon passive measures of protection or obtain protection from other troops.

The Threat. Bombardment aviation is the principal air threat to ground troops. These airplanes are able to deliver as many as 2400 rounds of machine-gun fire in 30 seconds. They carry fragmentation bombs which break into a large number of fragments upon detonation. Bombs loaded with liquid chemicals may be used.

Attacking airplanes are usually employed on a single mission in units of at least a squadron. They will seek remunerative targets such as troops in bivouac, in assembly areas, or on the march. These targets will often be located by the hostile observation aviation and reported to attack units; it is considered unwise for attack aviation to fly over a zone in search of suitable targets. They may approach their objectives at low altitudes, perhaps only a few feet above the ground, deliver their machine-gun attack from ranges of 1000 yards or more, then fly over the target to drop their bombs. The speed of flight is so great that an attack by a single unit is a matter of a few seconds. The defensive action which is taken must be rapid to provide a hope of success.

Active Measures of Protection. Troops armed with weapons suitable for antiaircraft fire are trained to engage promptly hostile aircraft within range. Rifles, automatic rifles, and caliber .30 and caliber .50 machine guns are suitable for this purpose. With these weapons hostile airplanes within 2000 yards should suffer losses although it cannot be expected that such attacks can be prevented. Infantry and field artillery units are able to provide their own active measures of defense against low-flying hostile aircraft. The effectiveness of their fires depends upon adequate training and provisions for air alarms. Skill in antiaircraft firing can be developed by training. An important part of this training is the development of confidence in the minds of the soldiers so that fire will be delivered with the maximum degree of coolness. The volume of fire which can be delivered quickly by an infantry battalion is very great. It is reasonable to expect that attacks by low flying aircraft against troops trained in this class of firing can be made costly, perhaps so costly as to be unremunerative.

Antiaircraft artillery is assigned the mission of attacking hostile aircraft at high altitudes. It cannot be expected that this materiel will be available to protect more than the

most vital installations and areas of largest troop assemblies. The characteristics of anti-aircraft artillery are discussed in Chapter II.

Passive Measures of Protection. For the purpose of this discussion, passive measures of protection are classified under five headings: *concealment, cover, dispersion, security, and speed.*

Concealment is employed to avoid detection by hostile aircraft. Partial concealment reduces the chance of detection. The use of wooded areas, movement in darkness and poor visibility, camouflage, and deception by dummy installations are examples of concealment. This means of protection should always be employed for the protection of troops in bivouac, assembly areas, or other massed formations while halted.

Cover is sought to minimize the effect of air attack weapons. It is provided by the natural physical objects of terrain such as ground folds, ditches, and reverse slopes. Protective clothing for use in the presence of chemical agents is classed as *cover*. As soon as the air alarm sounds, ground troops seek suitable covered positions in which to await the approach of the attacking planes.

Dispersion is resorted to in order to avoid presenting a remunerative target. It facilitates concealment, cover, and security. Irregularity in formation and marching in multiple columns are examples of dispersion while in movement. The effectiveness of air attack is reduced by separating individuals and units so that compact targets are not presented.

Security includes the measures which are taken to give warning of the approach of attacking airplanes. This information is obtained and disseminated by all headquarters. The aircraft warning service installed in each theater of operations may provide information in time to be of use. Close-in warning is provided by air lookouts. They are stationed on the front, flanks, and rear of a force to detect and give warning of the hostile approach.

Speed as a defense measure consists in completing operations in as short a space of time as possible in order to preclude the chance of planning and executing an air attack while the troops are in movement or exposed. The preparation and conduct of a march, entrucking and detrucking are especially vulnerable periods.

Friendly Pursuit Aviation. When it is available in sufficient quantities, the best protection of ground troops is afforded by friendly pursuit aviation. Its use may obtain air superiority so that hostile airplanes are denied an approach to the ground troops.

Protection of March Formations. The first step in the antiaircraft defense of a march is the adoption of a formation which promises the greatest cumulative protection by the application of active and passive measures and which is appropriate for the road net, terrain, and the logistics and tactics of the ground situation. A suitable formation which facilitates rapid deployment laterally and the delivery of defensive fires is the primary consideration. In order to enable troops to effect further quick dispersions from march formations, it is preferable to divide columns from front to rear, rather than a method whereby alternate units move laterally to opposite sides of the road. A formation which is rigidly applicable to all marching situations is not possible. The danger to marching troops from attack aviation is greatest when troops are forced by limited time, a poor road net, terrain preventing cross country movement, and tactical considerations, to make a daylight march in mass along well defined roads in normal route column formations. Marches under such adverse conditions should be protected by offensive air operations against the hostile aviation and by antiaircraft artillery. Machine-gun units should be attached, by platoon, to rifle companies and march by section when tactical requirements permit. It is highly desirable for motorized machine-gun sections to move by bounds from one selected position, 250 or more yards off the road, to another, with priority on roads where necessary. Machine guns in such positions generally will be outside the effective zone of the air attack. Against an enemy using gas, this machine-gun fire will constitute a very important defensive measure. A formation which may be feasible in many cases is a single file of foot troops on each side of the road, with vehicles which must accompany the foot troops moving by bounds between and following the files of foot troops.

Action When Attacked on the March. When the air attack alarm is sounded, or an actual attack is launched, all men with shoulder weapons, and other individuals not otherwise engaged, rapidly deploy off the road, seek what cover is immediately available, and open fire on the attacking planes. Ditches, gullies, small depressions, trees, and walls offer some cover from bomb fragments and grazing machine-gun fire. The fire of the suitable weapons in the rifle units, supported by the fire of the motorized machine-gun units from positions outside the effective attack zone, directed accurately toward low-flying planes, even for the few seconds of time available, may be expected to inflict losses on hostile planes and pilots. If animal-drawn units are present, the animals are moved off the road and tied to trees, fences, or telegraph poles, if the time permits. In many cases the animals will have to be held on or near the road. In all cases every effort must be made to prevent runaway animals, with the resultant confusion and injuries. The best time for riflemen to get in a few shots at the hostile planes is between the passage of the machine-gun fire and the detonation of the bombs. When bombs are released, all men



Plate 10. Air Attack on Ground Troops.

within their effective radius of burst cease firing and quickly lie prone under whatever cover is available. After the bombs dropped in the close vicinity of a unit have detonated, preparation is made to fire at the planes in case they circle, or to fire at any succeeding elements in the air attack. All commanders down to include squad leaders exercise such supervision as may be practicable in the time available. If the enemy has initiated the use of chemicals, marching troops put on their gas masks at the first warning of air attack, and immediately follow with the action as outlined above. Thereafter the troops are promptly moved out of the gassed area and given such first aid measures as may be directed.

Night Marches. Night marches are usually less exposed to observation and attack from the air than by day. Passive measures alone can be taken by troops when they cannot see to fire on the enemy's planes. Even at night, marching troops should never remain standing at the halt for any length of time. When attacked at night, marching troops move off the sides of the road and throw themselves flat on the ground. When flares or other sources of illumination make hostile planes visible, all troops within range open

fire unless concealment is more important than fire, in which case troops refrain from looking upward.

Movements by Motors. This discussion includes the movement of motorized trains as well as troop movements by motor. Entrucked troops base their own protection against low-flying aircraft principally on passive measures. As meager a target as possible is presented for as short a time as possible. Nevertheless, the maximum fire is directed at attacking planes, although circumstances often greatly lower the efficiency of such fire, and sometimes preclude it. To prevent riflemen from shooting each other in a lurching truck, only men whose weapons can be supported (used with a rest) are designated to fire. It is not practicable to mount machine guns on all trucks carrying troops. Motorized machine-gun sections (infantry or antiaircraft artillery) may be distributed throughout an entrucked troop column. Generally, by day, vehicles of small columns move individually at varying distances up to several hundred yards and at the fastest practicable speed. Massing of troops and transportation and the closing up of trucks in one column are kept to the minimum at entrucking and detrucking areas, and during such activities an area machine-gun defense should be established. An area defense is also desirable to protect traffic jams. Every effort must be made to avoid traffic jams, or the closing up of trucks when halted. Motorization of infantry units is relatively new in our army. With this limited experience, opinion as to the conduct of entrucked infantry when attacked from the air has not crystallized. There are some who believe that entrucked infantry on good roads in daylight should engage attacking planes in a running fire fight. The obvious objections to this are that the attack aviation has the advantage in both speed and fire power, and accidents to disabled trucks introduce added danger. Others maintain that trucks should halt on or off the road when attacked from the air, and that the occupants should jump out and take cover if time is available, otherwise they should remain in the trucks. When attacked at night, such attacks usually being in the nature of harassment by single planes, the greatest protection may be secured by keeping in motion, particularly on dark nights or on roads that are not well defined to air observation.

Defense of Bivouac Areas. *General.* Troops in bivouac rely principally upon passive measures for their protection against air attack. If well dispersed over the terrain with good cover and concealment, bivouacked troops do not offer a very remunerative target to combat aviation. In open terrain with little or no facilities for natural cover and concealment, the plan for antiaircraft defense must be based upon defensive fires, dispersion consistent with effective fire defense, and the construction of shallow trenches and fox holes for protection against air attack weapons. There are several historical examples where deceptive concealment such as false lighting and false camp sites have been of value.



Plate 11. Protection Afforded by Fox Holes.

Individual fox holes, trenches or small depressions afford protection against the flat trajectory of the fragments of bombs, and machine-gun fire.

Selection of bivouac areas. The antiaircraft defense of a bivouac area begins with the selection of that area. On terrain which affords ample concealment, cover, and area for dispersion, fire defense is secondary in importance. Troops should not be bivouacked too close to landmarks, such as prominent hills or the junction of roads and streams. Attacking planes may use such landmarks for orientation; hence the route of attack may follow the general direction of these terrain features. In general, however, with modern aides to air navigation available in the plane itself, the route of approach of an air attack may not be limited to any particular direction. In some situations, an air attack may be launched from under cover of suitable terrain features or the early or late sun, and certain directions may appear more likely than others. Probable avenues of approach should be

taken into consideration in assigning bivouac areas to subordinate units and in the establishment of the fire defense.

Passive defense measures. It is generally necessary to resort to camouflage to supplement the amount of natural concealment available. The importance of camouflage and other passive measures increases with the time an area is to be occupied. Every precaution should be taken to avoid discovery. Movement within the area should be kept to a minimum, and roads and trails avoided by day. Existing roads and trails should be travelled at night in preference to forming new ones. New trails formed during the night should be camouflaged by daylight. Troops discovered moving into a bivouac area or attacked while in bivouac, should move to a new area, when practicable, as soon as the move can be made secretly. In locations liable to be attacked by aviation, troops should not bivouac in the same area for extended periods of time. The best use should be made of natural protective cover which serves as protection against air attack weapons. A considerable dispersion of units, and elements and individuals within units in bivouac, is always desirable, even where ample concealment is available. Air lookouts and air observers should be posted so as to detect the approach of hostile aircraft from all directions, and to transmit warnings, particularly to machine-gun fire units. Troops should **not halt or countermarch during the occupation of the area, and should not be formed unnecessarily early when moving out.**

Defensive fires. Provision should be made so that elements of an infantry unit are capable of mutually supporting defensive fires. This applies particularly to the establishment of a ring of mutually supporting machine-gun units, usually platoons, around the bivouac area so that enemy planes approaching from any direction are met by an effective volume of fire before they arrive within bomb or gas spraying range of the defended area. One or more machine-gun units should be emplaced within the bivouac area as a precaution against possible diving attacks and to fire at planes which cross the fire zone of the outside ring. When enough machine guns are available, best results will be obtained by emplacing machine guns in platoon units. This will generally be practicable when an infantry regiment is part of a larger force, the normal case, and part of the periphery around the regimental area is covered by the fire of adjacent units. In other situations it may be necessary to dispose the machine guns by sections. To be mutually supporting, and to give a uniformly effective fire power around the defended area, the machine-gun units should not be more than 1,000 yards apart, and emplaced so that their all-around fire is not masked by obstacles. All weapons suitable for antiaircraft fire should be kept loaded and at hand. *Units without weapons for defending themselves should be bivouacked so as to receive incidental protection from the fires of other units.*

Antiaircraft Defense in Combat. *Defense of assembly areas.* Assembly areas are generally occupied for a shorter time than bivouac areas. The tactical situation may limit the degree to which passive antiaircraft defensive measures can be applied. The time element usually limits the degree of organization of the antiaircraft defense. Within these limits, the defense of troops in assembly areas against enemy aircraft is similar to the defense of bivouac areas. One point usually requiring consideration is the relative merit of fire or concealment as the most appropriate counter-measure against hostile observation aviation. If assembly areas are attacked with effective concentrations of persistent gas, the troops must move without delay to new areas.

General comments. Units deployed for combat, especially entrenched troops, ordinarily offer a comparatively unremunerative target to combat aviation. Nevertheless, troops must be prepared to meet air attacks during the progress of a ground battle. Ordinarily, troops engaged with the enemy on the ground take cover from an air attack and direct the fire of all suitable weapons against hostile aircraft. The short time that fire is directed at hostile planes will usually have no appreciable effect upon the ground situation. In some cases, it may be necessary to designate certain weapons for antiaircraft fire. Troops should not fire on enemy planes not attacking them when such fire is less important than secrecy. An extensive use of air guards is impracticable for troops actually engaged with the enemy on the ground.

In the defense. Troops in the forward part of a battle position will offer a poor target to the enemy's combat aviation because of their concealment, cover afforded by

entrenched positions, and dispersion. Troops on the forward position should never fire on enemy planes not attacking them, if such fire would disclose their positions. Units whose positions have undoubtedly been discovered should fire on all enemy planes within range. The commander of a battalion sector is the lowest commander to authorize such fire. When so authorized, the opening of antiaircraft fire then becomes the responsibility of local commanders of small units. Reserves in defense will ordinarily be more vul-

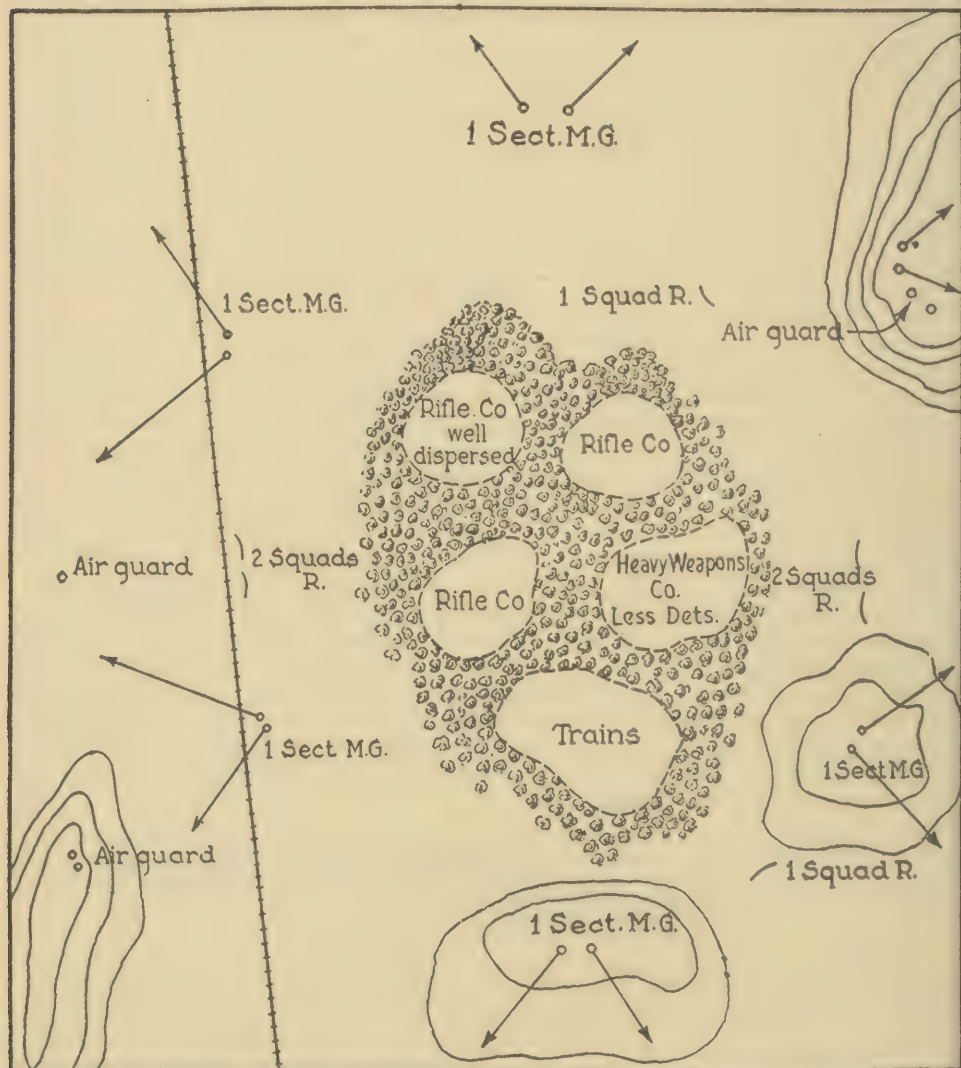


Plate 12. Infantry Battalion in Bivouac with Area Defense Against Air Attack.

nerable to air attack for the following reasons: they are usually held more concentrated; they are vulnerable during movement to places of employment; and they may not have the cover afforded by entrenched positions. Therefore, reserve units should make the utmost use of all practicable passive measures and defensive fire.

In the attack. Troops advancing the attack take cover and direct the fire of all available weapons against attacking planes. Troops in the attack ordinarily fire at all types of hostile planes within range, as the progressive antiaircraft fire by small units will be drowned out by the general firing in the ground engagement. Because of irregularities

of terrain, extended troop deployment, and difficulties of control, effective action against hostile aviation is usually the responsibility of small unit commanders.

Antiaircraft Defense of Trains. *Passive measures.* There is no reason, in most situations, for unit trains to move during the day. Trains must ordinarily depend upon such passive measures as are practicable, with incidental protection from fires of other nearby combat elements. Trains depend upon concealment, dispersion, and fires, in the order named, for protection against enemy aircraft. Concealment is secured by the use of overhead cover such as trees and buildings, by camouflage, and by absence of movement during good visibility. Dispersion should be sufficient to result in offering only unremunerative targets to enemy aircraft.

Defensive fires. Defensive fires for the trains may be furnished: by organized anti-aircraft troops; by attached infantry troops; by weapons organically a part of the trains; incidentally by fire from units having other missions at the time. The first method is the most effective when available, however, the movement of trains cannot be made with impunity when such a defense is set up. The second, though effective, is objectionable when it results in the diversion of fire power from the accomplishment of the primary combat mission. The number of organic weapons in infantry trains is not sufficient to provide an adequate fire defense, therefore negative measures must be relied upon. Incidental fire defense by troops engaged with enemy ground forces is uncertain.

ANTIMECHANIZED DEFENSE

Importance. It has been definitely established that tanks and other mechanized fighting vehicles constitute a serious threat on the battlefield as long as they can operate under favoring conditions of weather and terrain. These vehicles have definite limitations. They are sensitive to steep slopes, to marshes, to rivers and streams, to forests with large trees. But in open country their speed and power present a threat to all but the strongest defensive measures. See Chapter II.

Commanders of all forces must be alert to the possibility of mechanized attacks and raids. Their positions will be selected to reduce this hazard to the greatest degree attainable. They will seek natural obstacles to guard their front, flanks, and rear. Time permitting, they will increase the difficulty of tank operation by improvement of natural obstacles, by the use of barbed wire, by mine fields and other measures. Those areas which cannot be fully protected by such obstacles must be protected by the fire of anti-mechanized weapons. The speed with which such attacks are made requires that defense arrangements be made in advance and constantly maintained.

The means available for antimechanized defense are active and passive. The active means include antitank guns, artillery, attack aviation, armored vehicles, mines, and, in emergency, any firearms and explosives in the hands of the troops attacked. The passive means include natural barriers; road blocks; wire rolls; demolitions, and other artificial obstacles; buildings; and organized localities. Usually, active and passive means are used in combination. *A barrier or obstacle loses its defensive value unless protected by fire.* An extensive use of passive means on less critical fronts permits an economy of active means in order to concentrate the bulk at the decisive place.

Means Other Than Weapons.

Natural obstacles. Whenever and wherever possible the enemy should be denied favorable routes of approach, or his advance should be materially impeded by maximum use of some or any of the following natural obstacles: unfordable water, marshes, thick woods with large or strong trees, large boulders closely strewn, tree stumps that may belly a tank, deep steep-sloped gullies, precipitous slopes, and deep mud.

Artificial obstacles. For the reasons just stated, the maximum use should be made of any or all of the following artificial obstacles: antitank trenches, large shell craters, canals, walls, tank barriers, tank traps, and mine fields. It is essential to remember that obstacles, either natural or artificial, must be so located with reference to the defensive position that they can be effectively covered by small arms fire.

Antitank trench. If trenches are to be specially constructed or adapted for blocking tanks, the type of tank against which they are to form a protection must be con-

sidered. Antitank trenches should preferably have steep walls, a width somewhat greater than half the length of the tank they are intended to stop, and a sufficient depth.

(2) *Antitank mines.* Antitank mines are usually of the contact type. They are buried in the ground or scattered on its surface. To be reasonably effective, mines must be placed where enemy tanks can be expected to operate. The ends of underpasses, bridges, culverts, road defiles, fords, and defiladed ravines are semi-obligatory passages. In addition many other areas such as clumps of light woods and ground depressions will be indicated to the eye of anyone familiar with tank methods.

Mine fields should be combined with obstacles so that in avoiding the obstacles, tanks will run over the mines. To prevent the enemy from locating and destroying or avoiding the mines they must be carefully camouflaged from both ground and air observation. Edges of woods, wire entanglements, and shell-torn areas make good places to conceal mines from aerial photography. To form a real barrier, mines are usually laid checker-board fashion in two or three rows, with mines and rows of mines from 3 feet to 6 feet apart. Oftentimes it is impossible to assemble and plant such a quantity of mines, and an inferior mine field has to be accepted. The more fuses there are, the more effective the mine field. Extensions of fuses are often made. To give a broader danger area, camouflaged timbers may be laid between fuses. A mine containing 5 pounds of TNT will stop a light or medium tank upon direct contact.

Within a position, it is often possible to do more with mines than can be done in front of it or on its flanks.

Finally, the location of mines must be known to all of our own troops—particularly those operating any sort of vehicles. All mines must be recovered when our troops advance. Also, warning signs should be taken up from mine fields within the position, if a withdrawal is made.

Agencies other than infantry assisting in antitank defense.

(1) *Divisional artillery* may provide gun fire by either indirect laying with concentrations on tank bivouacs, assault positions, areas through which tanks must pass to reach their objectives, and assembly points, or else by direct laying with the individual pieces used as antitank guns.

(2) *Engineers* may prepare demolitions, assist in the preparation of barriers and obstacles or furnish material therefor, and provide antitank mines.

(3) *Observation aviation, mechanized cavalry, and all other reconnaissance agencies* are means that may be used to obtain information of hostile mechanized movements. Attack aviation may intervene in emergencies to disrupt the hostile operation.

(4) At times, *chemical troops* may assist by the use of smoke or gas. (Gases are used only in reply to an enemy who initiates their use.)

(5) Because they are essentially instruments of the attack, *our own tanks* are not well adapted to assist in the defense except where they can be employed aggressively, as in counterattack. Should our counterattack be of such size as to warrant the use of tanks, they may be of great assistance in expelling the enemy. They may operate effectively against foot troops following hostile tanks, or, under certain conditions, such as when our antitank defensive means are inadequate, they may operate with success against the hostile tanks themselves. Favorable opportunities for the latter would occur when hostile tanks have broken through our front line but have not yet reached their objective, or have become disorganized.

(6) With all due credit to the value of these arms in providing antimechanized protection, much of the close-in defense of infantry against armored vehicles must be provided principally by *infantry itself*. The weapons found within the infantry regiment are its primary means for this defense.

Weapons and Means Within the Infantry Regiment. The infantry's *small arms and machine guns*, when loaded with armor piercing ammunition, are effective weapons with which to attack mechanized vehicles. The penetrative capability of caliber .30 armor-piercing ammunition is not only of consequence against lightly armored mechanized vehicles but its bullet splash through cracks and vision slits is effective against more heavily armored mechanized vehicles.

Our 37-mm *antitank* gun is a powerful and effective weapon. It is low silhouetted, easily manipulated, and is capable of disabling any modern tank except very heavily armored tanks, with one hit.

Other expedients that have been used with minor success in the past are: *grenades* tied together and thrown at a tank track or under a tank; any sort of destructive means like a *rifle barrel* or *crowbar* run through a track mechanism to throw it or break it; *gasoline* or *petroleum* thrown in glass containers against tanks and ignited by incendiary bombs or *grenades*; *brush* or *dry grass* or *grain set afire* in order to drive out or destroy attacking vehicles. Such means, however, are crude makeshifts, well worth knowing and using in emergencies but not to be considered in planning organized defense measures. They are last resort measures to be used by troops lacking more effective means.

STANDING OPERATING PROCEDURES

Purpose and Importance. Standing operating procedures consist of methods of performing many recurring phases of troop movement or employment so as to reduce normal operations to routine. These methods are built up through practice and experience. Between large units such as the infantry division a considerable degree of variation is to be expected. Upon joining an organization, especially one which has performed extensive field operations as a unit, prompt inquiry should be made as to the exact nature of any standing procedures which are in use.

The advantage of the method lies in the increased simplicity and brevity of orders which must be issued for activities which recur frequently. Smoothness and efficiency of execution are increased. Time is saved and confusion may be avoided or reduced. Procedures can be built up and used with confidence in those large units which work together during an extended period without important or frequent changes of personnel. Their use has the additional advantage that they serve as a test of new methods which, after thorough proving, may find their way into training manuals issued by the War Department for the use of all. There is present the possibility that the good idea may be carried too far. They can succeed only when all commanders understand exactly what is required of them and of their units by each standing procedure because detailed instructions are omitted from routine orders. Changes occurring among the senior commanders, staff officers, or large personnel changes among the subordinate commanders present an immediate need for instruction, coordination, and practice. It can be overdone. Standing operating procedures should be regarded as tools to be used and exploited when conditions favor their employment and rejected when they may not apply.

The medical officer on duty with a force, such as an infantry division, must adjust and adapt the operations of his unit to the procedures of other organizations and the force as a whole. He must inform himself of the exact nature of the special procedures which are in use. He must provide instruction and practice for his own unit to enable it to function smoothly and confidently in accordance with these adopted procedures. Recognizing the limitations of the system, he may be able to develop worthwhile methods for a few of the recurring tasks which pertain solely to his own organization. Medical units are an integral part of the tactical structure. They must be able and ready to function as a part of a combat team in the same manner as all other units.

The Combat Team. Increasing use is being made of combat teams of relatively fixed composition. Basically, a combat team consists of an infantry regiment and a field artillery gun battalion which is habitually teamed with the same infantry regiment. Commanders of medical units should anticipate that certain units of the division medical battalion (or regiment), such as the collecting platoons, may be incorporated into combat teams. When this is done greater coordination is developed because commanders of all components become acquainted with one another, learn to work with one another, and gain a greater understanding of joint problems. Combat teams are designated by the number of the infantry regiment; hence, a combat team including the 1st Infantry would be designated as Combat Team No. 1. In many instances orders would issue to the combat teams as units, and the commander would not issue separate instructions to the components of the teams.

The March Group. A march group is a column consisting of a combat team, with attached units if any. It is commanded by the infantry regimental commander.

Standing Operating Procedures for Movement. Within the division, the commander may prescribe the components of each march group which will include the several units or detachments which constitute the force. Command of the march group passes to the infantry regimental commander when the movement is ordered and continues until march conditions cease or other orders are received. In the usual case the division commander warns the units sufficiently in advance of the contemplated movement to permit the necessary preparations to be made.

As soon as practicable or desired after the warning, the division commander orders the movement, except possibly the time of starting. Representatives of units and detachments report to the commander of the march group to which assigned as early as possible after receipt of orders for the movement, with information of positions of units or detachments, and time when they will be ready to move. The representatives then return to their units with instructions from the march group commander. When the march group is ready to start, or the time of readiness is known definitely, the march group commander reports to the division commander "March Group (No.) ready at (hour)." As soon as the march groups have reported ready, the division commander orders the time of starting.

Ordinarily it is practicable and desirable to form the march group as it moves and without assembling it beforehand. This saves time and may avoid unnecessary marching. Elements of the march groups remain in their initial positions, such as bivouac areas, as long as practicable in order to rest the troops and perfect preparations.

A march group includes foot troops and motor vehicles loaded with personnel, equipment, and supplies. In the movement, motor vehicles move by bounds of the greatest practicable length. March group commanders report to division headquarters the position of the head of their respective groups excluding the security detachment as of the hour. The position is defined by the distance in miles from the initial point. For example: "March Group 2—10."

Unless tactical conditions dictate otherwise, it is particularly important that the time length and road space of motor columns be reduced to the minimum. In executing motor movements the leading vehicle moves at the prescribed speed, so far as practicable, but never exceeds it. Every vehicle of the column is kept closed on the vehicle ahead to the limit of safety, but this distance is not fixed in yards; rather, it is based on safety and the judgment of the driver himself as a result of training, experience, and supervision. In halting, the leading vehicle halts at the proper time; others close on it to two yards, tactical conditions permitting.

Standing Operating Procedures for Development for Combat. The division may be assembled preparatory for combat, the units moving into assembly areas, or it may be committed to action directly from march columns.

When the division is to assemble, on call of the division commander, guides from the march groups go ahead to the assembly area or other designated point, where assembly areas are assigned by the division commander. The march groups follow—without halting if possible—and are met by the guides and conducted to the assembly area. Every effort should be made to clear the roads for units in rear. A plan of traffic circulation is devised and traffic guides posted. Until otherwise prescribed by the commander, march groups remain intact during assembly. Communication between division headquarters and major units is established at once.

Standing Operating Procedures Appropriate for Medical Units. On the march a collecting platoon may be attached to each march group for march collection.

In combat, unit commanders of regiments, battalions, and similar units are responsible for the initial treatment, collection, and evacuation of the casualties of their units to unit aid stations. The medical battalion (or regiment) is responsible for gaining and maintaining contact with the aid stations and evacuating their casualties. Collecting platoons, usually one in support of each combat team engaged, establish their normal installations.

In moving situations, the collecting platoon commanders establish and advance the collecting platoons on their own initiative (unless otherwise prescribed), reporting promptly their locations to the division surgeon. Reinforcing units are requested from corps when necessary. The command post of the medical battalion is usually established at the site of the clearing station.

CHAPTER V

COMMAND AND STAFF PROCEDURE

The staff which serves the troops best, serves the commander best.

Medical officers are assigned in large numbers to duty with tactical organizations, such as medical battalions or regiments, and as attached medical personnel with units of the arms, such as the infantry regiment. In the execution of these tasks they may serve as commanders or staff officers of medical units, or as a staff officer, in addition to other duties, of a unit such as the infantry regiment or division. The duty involved in either capacity requires the medical officer to function in accordance with the principles evolved for the control of military units in command and staff procedure.

Command Responsibility. The commander alone is responsible to his superior for all that his unit does or fails to do. He cannot shift this responsibility to his staff or to subordinate commanders.

All orders from a higher to a subordinate unit are issued by the commander of the higher unit to the commander of the subordinate unit. If it is impracticable to comply with the orders received, due to an emergency or a change in the situation, the subordinate commander should so report to his superior. If it is impracticable to report, the subordinate commander should act according to his judgment and the policy of the commander, and report at the earliest practicable time the action so taken.

In order to expedite the execution of orders and to promote teamwork between units, a commander may authorize his staff officers to communicate directly with the staff officers of other units as to the details of orders issued or received. Interstaff communication, when used, should be arranged preferably by the commanders concerned.

Definition and General Functions of the Staff. The staff of a unit consists of the officers who assist the commander in his exercise of command. (See Plate 1.)

The staff secures and furnishes such information as may be required by the commander, prepares the details of his plan, translates his decision and plan into orders, and causes such orders to be transmitted to the troops. It brings to the commander's attention matters which require his action or about which he should be informed, makes a continuous study of the situation, and prepares tentative plans for possible future contingencies for the consideration of the commander. Within the scope of its authority, it supervises the execution of plans and orders and takes such other action as is necessary to carry out the commander's intentions.

The staff officer should have a thorough knowledge of the policies of his commander and should be acquainted with subordinate commanders and their units. A staff officer should be an active, well-informed assistant to the commander and a helpful adviser to subordinate commanders.

Classification of Staff Officers. The staff of a division or larger unit may be subdivided into two main groupings:

A general staff group organized so as to include all functions of command and composed of officers of the General Staff Corps and officers detailed as their assistants.

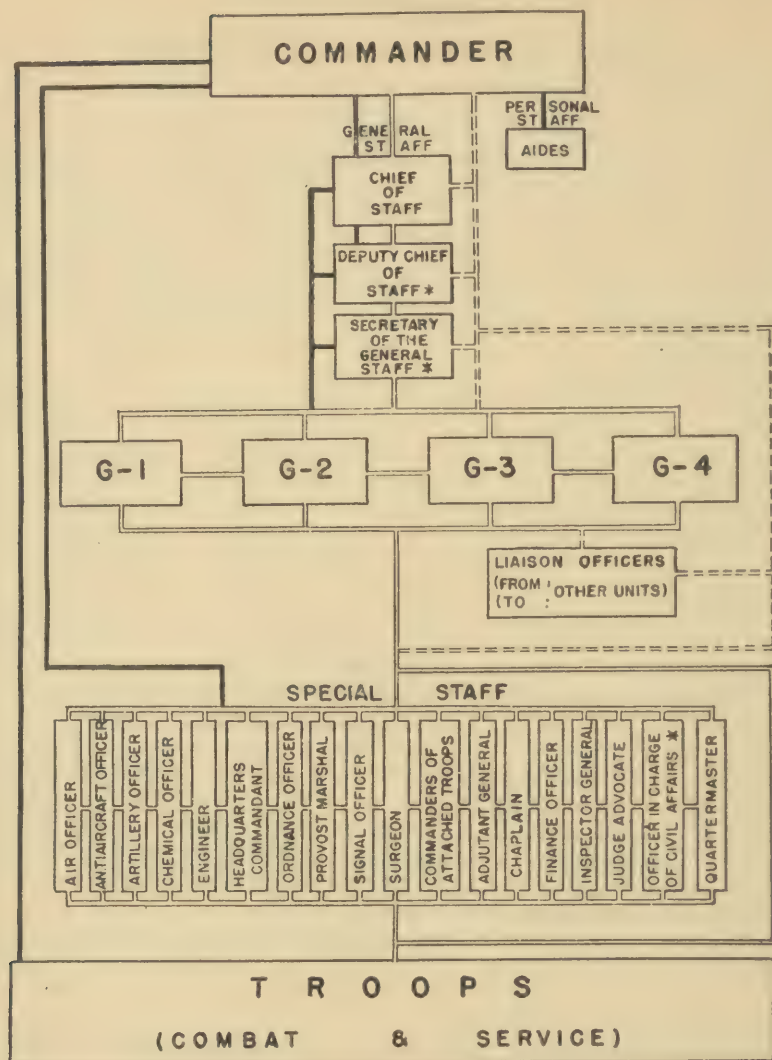
A special staff group, consisting of all staff officers assigned, attached, or who have duties at the headquarters and are not included in the general staff group. It includes certain technical specialists and heads of service.

In units smaller than a division, the same officer frequently performs duties of both general and special staff nature; consequently there can be no definite subdivision of such staffs into general and special staff groups.

Personal staffs or aides as authorized by law for certain general officers perform the duties prescribed by the general officer to whom assigned. They may be assigned to additional duties with the unit staff. They may be directed to keep the chief of staff or executive informed of the commander's whereabouts and of the general content of any oral instructions he may have issued during an absence from the command post.

Liaison officers.

Organization. Basis. The organization of a staff is based upon the duties of the commander. The general distribution of personnel to staff sections is shown in Tables



* IN CERTAIN UNITS
WHEN NOT REPRESENTED
ON SPECIAL STAFF.

— COMMAND CHANNEL (DOWN)
— ROUTINE CHANNEL FOR —
ADVICE AND RECOMMENDATIONS (UP)
COORDINATION (DOWN)
COOPERATION
INFORMATION

=== OCCASIONAL CHANNEL FOR ADVICE AND
RECOMMENDATION (UP)
INFORMATION

Plate 1. Command and Staff Procedure.

of Organization. The detailed allotment of personnel to sections, particularly in the general staff group, will be made by the commander.

(1) The duties of all commanders can be divided into four principal functional groups as follows:

- Personnel.
- Military intelligence.
- Operations and training.
- Supply and evacuation.

(2) These 4 subdivisions of command duties, under a coordinating head, exist in the staffs of all units. In the staffs of the smaller units of certain arms or services the duties of two or more of these subdivisions may be performed by one staff officer. The coordinating head is the chief of staff in the division and higher units (executive in brigades and smaller units). He is responsible directly to the commander.

Division into two echelons. For convenience of operation it is necessary frequently to divide the staff into two echelons. The *forward echelon* consists of the elements required immediately by the commander for tactical operations; and the *rear echelon*, of the remainder of the staff required for administrative activities.

The composition of the forward and rear echelon of various headquarters is contained in the discussion herein of the *general staff* and *special staff*. In addition to the designated general and special staff officers, liaison officers from other units and the commander's personal staff (*aides*) may be with the forward echelon.

Cooperation. Teamwork is essential within and between staffs and between staff and troops. It is assured by cooperation and collaboration within and between all sections of the general and special staff groups, between the staff and troops, and between the staffs of subordinate, higher, and adjacent units. Prompt dissemination of essential information and of decisions and orders within and between groups is vital to the efficient functioning of a command.

The general staff group should consult the special staff officers as to the ability of their respective arms and services to execute contemplated missions, and give the special staff timely warning of operations in order to permit preparations.

Conferences of the staff including available subordinate commanders are often helpful. At other times individual personal contact is a more effective and practical procedure.

Authority. A staff officer as such has no authority to command. All policies, decisions, and plans whether originating with the commander or with the staff must be authorized by the commander before they are put into effect. When a staff officer by virtue of delegated authority issues an order in the name of the commander, responsibility remains with the commander even though he may not know of the order.

The dual functions of certain officers who are unit commanders as well as special staff officers are presented herein.

A Guide for Staff Officers. A new commander is apt to assume that everything is running smoothly and satisfactorily if too many complaints and appeals from decisions of his headquarters do not crop up. Having confidence in his staff, he is prone to let these officers decide for themselves what matters should be brought to his attention. Such a hit-or-miss system may result in a staff-run organization or in the commander being swamped under a mass of trifling details which his staff should handle.

The memorandum¹ which is reproduced below was placed in effect by Major General Frank S. Cocheu with a view to exercising command without infringing on any of the duties and prerogatives of staff officers, and is said by him to be the product of many years of experience.

MEMORANDUM: For the Staff.

1. The following will be brought without delay to the attention of the Commanding General:

- a. Subjects of importance which require prompt action and are not covered by existing policies and instructions.
- b. Disapprovals from higher authority.
- c. Errors, deficiencies or irregularities alleged by higher authority.
- d. Communications that allege neglect or dereliction on the part of commissioned personnel.
- e. Correspondence or proposed correspondence conveying even a suggestion of censure.
- f. Appeals from subordinates from decisions made at this headquarters.
- g. Subjects which affect the good name or reputation of an officer or organization.
- h. Subjects involving financial or property irregularities.
- i. Serious accidents involving personnel of the command.

¹ Reproduced with permission of Major General Frank S. Cocheu, U. S. A., Retired.

2. The following will be presented to the Commanding General for final action:
 - a. Requests and recommendations to be made to higher authority.
 - b. Suggested disapprovals.
 - c. Communications that contain a suspicion of censure.
 - d. Communications that involve the good name of an officer or organization.
 - e. Reports of financial and property irregularities.
 - f. Letters to civil authorities in high positions.
 - g. Endorsements on efficiency reports.
 - h. Correspondence concerning war plans.
 - i. Communications of exceptional information.

3. A copy of these instructions will be kept exposed at all times upon the desk of each staff officer of this headquarters.

Liaison. A staff officer should visit subordinate units to acquaint them with conditions which cannot be explained in orders, and to obtain information for the use of the commander and his own staff section. The procedure for officers on liaison missions should be followed.

THE GENERAL STAFF

Duties. The general statutory duties of the general staff with troops are to render professional aid and assistance to the general officers over them; to act as their agents in harmonizing the plans, duties, and operations of the various organizations and services under their jurisdiction; to prepare detailed instructions for the execution of the plans of the commanding general; and to supervise the execution of such instructions.

This subdivision of activities is intended only as a guide in assigning duties to the general staff sections. The unit commander may and should make such adjustment of duties as best meets operating conditions.

The general staff group is responsible for preparing and issuing all combat orders except those orders issued by the commander in person.

The general staff group supervises the execution of orders to insure understanding and execution in conformity with the commander's will.

Organization; Designation. *Divisions and higher units.* The general staff group of divisions and higher units is organized in 4 sections corresponding to the functional subdivisions of command. The group includes the necessary coordinating personnel. The chiefs of sections are designated as assistant chiefs of staff, G-1, G-2, G-3, and G-4. The organization includes:

- Coordinating personnel—chief of staff, assisted by—
 - Deputy chief of staff (in army and higher units).
 - Secretary of the general staff (in army and higher units).

Staff sections.

- Personnel section (G-1).
- Military intelligence section (G-2).
- Operations and training section (G-3).
- Supply and evacuation section (G-4).

In some divisions the general staff group consists of the chief of staff and three sections. The chiefs of sections are designated as assistant chiefs of staff, G-2, G-3, and G-4.

Units smaller than division. In units smaller than the division, to include the battalion (or equivalent unit), duties corresponding to those of the general staff group are assigned to officers listed below. Staffs of many smaller units are of such limited size that one staff officer is charged with the duties of two or more staff sections.

- (1) Chief of staff—the executive officer.
- (2) Personnel section—the adjutant (S-1).
- (3) Military intelligence section—the intelligence officer (S-2)

(4) Operations and training section—the plans and training officer (S-3).

(5) Supply and evacuation section—the supply officer (S-4).

Forward and rear echelons. The forward echelon of the headquarters of a unit usually includes all of the officers whose duties are of general staff nature. Representatives of G-1 (S-1) and G-4 (S-4) may be at the rear echelon.

Flexibility of Operation. Although the general staff group is organized into 4 sections there is much overlapping of duties; coordination and prompt interchange of information between sections are essential. In addition, general staff officers may be required to assist, or to take over temporarily, one or more other sections. This condition frequently exists in divisions and corps, especially when the headquarters of these units are operating on a 24-hour basis. It is of vital importance in smaller units.

Chief of Staff (executive in brigades and smaller units.) The chief of staff or executive is the principal assistant and adviser to the commander. He may transmit the decisions of the commander to appropriate staff officers for preparation of the necessary orders, or transmit them in the form of orders to those who execute them. He is the principal coordinating agency of the command. He performs the following specific duties:

Formulates and announces policies for the general operation of the staff.

Directs and coordinates the work of the general and special staff in respect to:

(1) Activities of the sections within the general and special staff groups.

(2) Relations between the general and special staff groups.

(3) Relations between the general and special staff groups and the troops.

Keeps the commander informed of the enemy situation, the situation relative to adjacent and supporting units, and the situation of the command as to location, strength, morale, training, equipment, supply, evacuation, and general effectiveness.

Represents the commander during his temporary absence or when authorized to do so. (In certain small units the second in command is designated by Tables of Organization as executive, hence succeeds automatically to the command when the commander ceases to function.)

Receives decisions from the commander and takes the following action:

(1) Makes such additional decisions as may be directed by the commander and gives necessary instructions to the staff in furtherance of these decisions.

(2) Allots the detailed work of preparing plans and orders and when time permits coordinates the resulting drafts and submits them to the commander for approval.

Takes steps to insure that all instructions published to the command are in accord with policies and plans of the commander.

By personal observation, and with the assistance of the general and special staff sections, sees that the orders and instructions of the commander are executed.

Makes a continuous study of the situation with a view of being prepared for future contingencies.

Assembles the routine staff section reports and after their approval by the commander forwards required copies to higher headquarters.

Deputy Chief of Staff (in army and higher units only). The relations of the deputy chief of staff to other members of the staff and to the troops are similar to those of the chief of staff. The deputy chief of staff assists the chief of staff and acts for the latter in his absence.

Secretary of the General Staff (in army and higher units only). The secretary of the general staff performs the following duties:

Acts as executive officer for the chief of staff and deputy chief of staff.

Maintains an office of temporary record for the chief of staff and deputy chief of staff.

Routes papers received in the office of the chief of staff to their proper destinations.

Forwards correspondence to its destinations in the headquarters and establishes a follow-up system to insure prompt action on and return of papers.

Receives officials visiting headquarters for the purpose of conferring with the commander, the chief of staff, or deputy chief of staff.

Collects statistical data for the commander, chief of staff, and deputy chief of staff.

Personnel (G-1) Section. The personnel section is charged with the formulation of

policies and the supervision of the execution of administrative arrangements pertaining to personnel of the command as individuals, civilians under supervision or control of the command, and prisoners of war.

In divisions in which there is no provision for a G-1 section, the supervision of activities listed below will be assigned to the G-4 section, or as may be directed by the division commander.

The specific duties of the personnel section may include the planning for and supervision of activities concerning—

(1) Procurement, classification, reclassifications, assignment, pay, promotion, transfer, retirement, and discharge of all personnel. (Coordination with G-3 in assignment and transfer of personnel.)

(2) Replacement of personnel. (Coordination with G-3 for priorities.)

(3) Decorations, citations, honors, and awards.

(4) Leaves of absence and furloughs.

(5) Rewards and punishment.

(6) Internal arrangement of headquarters. (Coordination with G-4 for construction.)

(7) Religious, recreational, and welfare work; supervision of military and non-military agencies devoted to such work. (Coordination with G-3 for allotment of time for recreational and morale work.)

(8) Army postal service. (Coordination with G-4 for movement; G-2 for censorship.)

(9) Strength reports and graphs, casualty reports, prisoner of war reports, station lists, and other personnel statistics.

(10) General regulations and routine administration which especially concern individuals, or routine administration not specifically assigned to another general staff section.

(11) Furnishing the commander advice on morale.

(12) Collection and disposition of stragglers.

(13) Collection and disposition of prisoners of war. (Coordination with G-2 for identifications and questioning; G-4 for transportation and for location and construction of prisoner of war enclosures.)

(14) Recommendations as to provisions for shelter for the command and administration of quartering areas. (Coordination with G-3 for location of areas; G-4 for construction.)

(15) Sanitation. (Coordination with G-4.)

(16) Relations with civil government and civilians in the theater of operations, including initial establishment and operation of military government or martial law. (FM 27-5.) (Coordination with G-4 for transportation for civilians to be evacuated and feeding of civilians; G-3 for evacuation of civilians as it affects operations; G-2 for censorship.)

(17) Maintenance of law and order within the command.

(18) Graves registration service, including burials. (Coordination with G-4 on acquisition of cemeteries.)

(19) Supervision of matters concerning members of our forces who are prisoners in enemy hands.

(20) Preparation of such parts of administrative plans and orders as relate to activities under the supervision of the personnel section. (Coordination with G-4.)

Military Intelligence (G-2) Section. The military intelligence section is charged with the planning and preparation of orders and to some extent with operations pertaining to the collection, evaluation, interpretation, and distribution of information of the enemy and with counterintelligence activities. Its primary function is to keep the commander and all others concerned informed regarding the enemy's situation and capabilities.

Operations and Training (G-3) Section. The operations and training section is charged with those functions of the staff which relate to organization, training, and combat operations. It is responsible for tactical and training inspections, as directed by the commander (AR 265-10).

The specific duties of the operations and training section may include:

(1) Preparation and coordination of plans for and supervision of:

(a) Mobilization of the command.

(b) Organization and equipment of units. (Coordination with G-4 for allocation of equipment.)

(2) Preparation and coordination of plans for and supervision of training of units and individuals, including:

(a) Preparation of training directives, programs, and orders. (Coordination with G-2 for combat intelligence training.)

(b) Selection of training sites and firing and bombing ranges. (Coordination with G-4 on preparation of sites and ranges.)

(c) Organization and conduct of schools.

(3) Operations, to include, in general: tactical and strategical studies and estimates; plans and orders based thereon; supervision of combat operations; and future planning. Specific duties relative to operations may include:

(a) Continuous study of the tactical situation, as affected by:

1. The enemy situation. (Coordination with G-2.)

2. Instructions from higher units.

3. Actions of adjacent or supporting units.

4. Location, morale, and capabilities of the troops. (Coordination with G-1 for morale matters.)

5. Needs for replacements and reinforcements. (Coordination with G-1 for replacements.)

6. Terrain and weather conditions. (Coordination with G-2.)

7. Status of equipment and supplies. (Coordination with G-4 for priorities of replacement of matériel and allocation of supplies.)

(b) Preparation of estimates, reports, and recommendations based on the tactical situation.

(c) Preparation of plans for and supervision of activities concerning:

1. Reconnaissance and security measures. (Coordination with G-2 for intelligence missions of combat troops.)

2. Troop movements. (Coordination with G-4 for movements requiring transportation in addition to organic transportation and for routes.)

3. Tactical employment of units. (Coordination with G-4 for influence of supply and evacuation on operations; G-2 for capabilities of enemy; G-1 on morale of troops.)

4. Defense of administrative installations and lines of communication. (Coordination with G-4.)

5. Tactical measures to preserve secrecy and effect surprise. (Coordination with G-2.)

(d) Preparation and authentication of field orders and operation maps required to carry out the tactical plan, and their transmission to units and staff officers concerned. (Coordination with G-2 for maps and for paragraphs and annexes dealing with enemy information, reconnaissance, and counterintelligence measures; G-4 for paragraph dealing with administrative matters.)

(e) Maintaining contact with the commanders of subordinate units; observing or supervising troop movements and tactical operations as directed by the commander.

(f) Establishment of liaison with adjacent, higher, and subordinate units.

(g) Supervision of signal communication.

(h) Preparation of tentative plans for subsequent phases of a tactical operation and for future tactical operations. (Coordination with G-2 for enemy capabilities; G-4 for practicability of operations from a supply point of view.)

(4) Recommendations to the commander of priorities for assignment of personnel and equipment. (Coordination with G-1 for assignment of personnel; G-4 for allocation of equipment.)

The organization of the operations and training section in each unit will vary with the personnel available and the work to be accomplished. In corps and higher units,

separate subsections pertaining to administration, organization, training, operations, and troop movements may be organized.

Supply and Evacuation (G-4) Section. The supply and evacuation section is charged with the preparation of policies for, and the supervision of execution of arrangements for supply, evacuation, transportation, and other administrative matters related thereto. It is responsible for advising the commander relative to the extent of the administrative support that can be given to any proposed strategical or tactical line of action, and for recommendations as to the necessary decisions concerning supply and evacuation. It is further responsible for the development of those details of the administrative plan which pertain to its functions, the preparation of the necessary orders, and the supervision of their execution.

The specific duties of the supply and evacuation section may include the planning for and supervision of activities concerning:

- (1) Procurement, storage, and distribution of all supplies including animals. (Coordination with G-3 for priority of allocation of supplies.)
- (2) Location of supply, evacuation, and maintenance establishments.
- (3) Transportation of supplies by land, air, and water.
- (4) Construction and maintenance of roads and trails, docks, and airdromes.
- (5) Maintenance of equipment. (Coordination with G-3 for priorities.)
- (6) Recommendations for allocation of small arms ammunition and antitank mines. (Coordination with G-3.)
- (7) Traffic control. (Coordination with G-3 for tactical plan and secrecy.)
- (8) Construction, operation, and maintenance of utilities and other facilities relating to supply, shelter, transportation, and hospitalization, but exclusive of fortifications.
- (9) Evacuation and hospitalization of men and animals.
- (10) Assignment and movement of supply, medical, technical, and labor troops not employed as combat troops. (Coordination with G-3 to avoid conflict with tactical movements.)
- (11) Salvage.
- (12) Collection and disposition of captured supplies, equipment, and animals. (Coordination with G-2 for examination of matériel.)
- (13) Recommendations concerning protection of lines of communication and rear establishments. (Coordination with G-3.)
- (14) Recommendation as to location of rear boundaries.
- (15) Recommendation as to location of rear echelon of headquarters. (Coordination with G-1.)
- (16) Property responsibility.
- (17) Funds and priority of expenditure.
- (18) Construction, operation, and maintenance of military railways.
- (19) Operation of inland waterways.
- (20) Recommendations as to new types of equipment. (Coordination with G-3.)
- (21) Procurement of real estate, shelter, and facilities, including their leasing, repair, maintenance, and disposition.
- (22) Acquisition and improvement of airplane bases.
- (23) Preparation, authentication, and distribution of administrative orders, both fragmentary and complete. (Coordination with G-3 for details of tactical plan; G-1 for details pertaining to the activities supervised by the personnel section.)

The organization of the supply and evacuation section in each unit depends upon the personnel available and the work to be accomplished. In corps and higher units, separate subsections pertaining to administration, construction, evacuation, supply, and transportation may be organized.

THE SPECIAL STAFF

General. General functions. The special staff operates with the general staff under the policies prescribed by the unit commander. The general functions of the special staff group include:

(1) Technical and tactical advice and recommendations to the commander and his **general staff**.

(2) Preparation of plans, estimates, and orders in order to relieve the general staff of routine duties.

(3) Coordination with the general staff sections of their tactical and administrative plans and activities.

Dual functions. In certain cases, special staff officers are also commanders of troops or heads of technical, supply, or administrative services and as such have the usual functions of command or control over such troops or services; for example, the commander of the artillery troops of an infantry division is also the division artillery officer. These two functions of staff and command, although vested in a single individual, are separate and distinct in that each involves different responsibilities and duties, and the exercise of one should not be confused or permitted to interfere with the exercise of the other. On the contrary, this dual function of certain officers has many advantages in facilitating the proper discharge of both staff and command duties of the officers concerned.

Relations With Subordinate Units. While certain of the duties charged to special staff officers apply to the unit as a whole, the unit commanders are primarily responsible for all phases of planning, training, and execution of all activities of their commands; and directions or instructions issued subordinate units must be transmitted through the proper channels of command and not directly from one special staff officer to the corresponding special staff officer in a subordinate unit. Within the limits and in the manner prescribed by the division or higher commander a special staff officer's duties may include:

Technical and tactical supervision, coordination, and inspection of subordinate units of his arm or service not commanded by him.

Appropriate technical inspection of all subordinate units.

Handling routine reports directly from corresponding staff officers of subordinate units.

Composition. Divisions and higher units. The special staffs of divisions and higher units include such of the following officers as are assigned to the unit:

- (1) Air officer.
- (2) Antiaircraft officer.
- (3) Artillery officer.
- (4) Chemical officer.
- (5) Engineer.
- (6) Headquarters commandant (combined with provost marshal in certain units).
- (7) Ordnance officer.
- (8) Provost marshal (combined with headquarters commandant in certain units).
- (9) Signal officer.
- (10) Surgeon.
- (11) Commanders of attached combat units having no special staff representative.
- (12) Liaison officers.
- (13) Adjutant general.
- (14) Chaplain.
- (15) Finance officer.
- (16) Inspector general.
- (17) Judge advocate.
- (18) Officer in charge of civil affairs (initially in GHQ and other territorial commands, when required). (FM 27-5.)
- (19) Quartermaster.

Sections. Special staff sections are shown in Tables of Organization. They are headed by the special staff officers shown above. The title may be followed by the designation of the unit when necessary, thus: Financial Officer, II Corps.

Brigades and smaller units. In addition to the staff officers corresponding to the chief of staff and the four general staff sections in larger units (executive, S-1, S-2, S-3,

and S-4), the staffs of brigades, regiments, and battalions, corresponding to the special staffs of larger units, include such of the following as may be assigned to the unit:

- (1) Communication officer.
- (2) Gas officer.
- (3) Liaison officer(s).
- (4) Reconnaissance officer.
- (5) Surgeon.
- (6) Commanders of attached combat units not represented on the staff.
- (7) Chaplain.
- (8) Motor officer (designated as maintenance officer in some units).
- (9) Munitions officer (armament officer in Air Corps units). (Duties frequently combined with those of S-4.)

Forward and rear echelons. In divisions and higher units the headquarters usually are divided so as to include the special staff officers assigned to the units and listed above in the forward echelon, and in the rear echelon. In certain units a special staff section at the rear echelon may have a representative at the forward echelon.

Duties. The duties of the several special staff officers, as listed herein, are intended as a guide. The commander may and should adjust duties to meet operating conditions. In the performance of their duties, special staff sections are ordinarily subject to supervision and coordination by appropriate general staff sections. Certain of the special staff officers whose duties are listed have both command and staff functions. *Only those duties pertaining to their functions as staff officers are listed in this chapter.*

Air Officer. Adviser to the commander and staff on air matters.

Preparation of plans for the use of air units, including recommendations for their allotment to subordinate units.

Administrative responsibility through subordinate air base commanders for the air units operating under theater control (air officer, theater of operations, only).

Coordination, within limits prescribed by the commander, of the utilization of all air units of the command.

Determination of requirements, procurement, storage, and distribution of aircraft ammunition and air technical supplies. Furnishing information as to the status of aircraft ammunition and air technical supplies.

Obtaining and disseminating meteorological data for use by the command, except that obtained by the field artillery and other units for their own use.

Examination of captured aviation equipment.

Antiaircraft Officer. Adviser to the commander and staff on all antiaircraft matters, including passive defense measures.

Determination of requirements and recommendations for apportionment of anti-aircraft artillery ammunition.

Planning for coordination of all means of active defense against air operations in cooperation with the unit air officer.

Recommendations as to missions for antiaircraft artillery including recommendations for allotment to subordinate units.

Artillery Officer. Adviser to the commander and staff on field artillery matters.

Supervision of the training of the field artillery of the unit.

Preparation of plans for the use of field artillery, including recommendations for its allotment to subordinate units.

Coordination of the survey system within field artillery units.

Supervision of observation, signal communication, and liaison within the field artillery.

Supervision of supply of meteorological data for the field artillery.

Determination of requirements, recommendations for apportionment, and supervision of distribution of field artillery ammunition. Furnishing information as to status of ammunition supply.

Coordination of fires of the field artillery of subordinate units.

Plans for artillery missions to be performed by observation aviation.

Collection and dissemination of information pertaining to hostile artillery and other targets through artillery intelligence agencies.

Chemical Officer. Adviser to the commander and staff on all chemical matters, including the use of chemicals by the various arms.

Preparation of plans for the use of chemical troops, including recommendations for their allotment to subordinate units.

Supervision of the operations of chemical troops not assigned to subordinate units.

Supervision, within limits prescribed by the commander, of all chemical training, including inspections.

Supervision, within limits prescribed by the commander, of collective protective measures, including gas-proofing of inclosures, and the decontamination of gassed areas, equipment, and vehicles.

Examination of captured chemical equipment, and collection and evaluation of other information concerning means and methods of utilization of chemicals by the enemy and our own troops and the results obtained.

Determination of requirements, procurement, and distribution of chemical equipment and supplies for all units, and chemical munitions for chemical troops.

Operation of chemical storage, maintenance and repair facilities, and rehabilitation of salvaged chemical material.

Technical inspection of supplies, equipment, and ammunition, stored and issued by the Chemical Warfare Service.

Supervision of the filling of such chemical munitions as may be prescribed to be performed in the theater of operations.

Estimation of requirements and recommendations for apportionment of chemical munitions to chemical troops. Furnishing information as to the status of chemical warfare service ammunition supply.

Engineer. Adviser to the commander and the staff on engineer matters.

Preparation of plans for the use of engineer troops, including recommendations for their apportionment to smaller units.

Determination of requirements, procurement, storage, and distribution of engineer equipment and supplies, including camouflaging materials.

Construction, maintenance, and repair of camps, cantonments, warehouses, hospitals, and other structures, including incidental installations (except signal communications) of roads and trails, and all means of river crossings, of docks, and of airdromes and landing fields.

Supply of all fortification materials, and the construction of such defensive works as may not be assigned to other troops.

Construction, repair, maintenance, and operation of railways, portable and fixed electric light plants, water supply systems, and all other utilities of general service not otherwise assigned.

Military mining, demolitions, and the construction and removal of obstacles.

Surveys, mapping, and the procurement, production, and distribution of maps.

Engineer reconnaissance.

Recommendations as to traffic regulations on roads and bridges as may be required by their physical condition.

Preparation and posting of signs for marking routes.

Supervision, within limits prescribed by the commander, of engineer and camouflage activities in subordinate units, including such work performed by troops other than engineers.

Development within the unit of measures for camouflage of personnel and installation; preparations of instructions concerning camouflage, use of camouflage material, and protective coloration of all equipment except aircraft.

Examination of captured engineer equipment.

Headquarters Commandant. Local security of the headquarters.

Internal administration and arrangements for moving headquarters.

Detail of orderlies and messengers.

Supervision of headquarters mess.

Messing and quartering of casuats.

Reception of visitors at certain headquarters.

Ordnance Officer. Adviser to the commander and staff on ordnance matters.

Preparation of plans for use of ordnance troops not assigned to subordinate units.

Collection and evaluation of information concerning means and methods of utilization of ordnance matériel and ammunition by the enemy and our own troops, and the results obtained.

Procurement, storage, and distribution (in accordance with apportionments as approved by the commander) of ammunition and of other ordnance supplies and equipment.

Operation of ordnance storage, maintenance, and repair facilities, including salvage and repair of ordnance matériel.

Technical inspection of ordnance equipment.

Supervision, within limits prescribed by the commander, of ordnance activities in subordinate units.

Provost Marshal. Adviser to the commander and staff on matters pertaining to the duties of the military police.

Enforcement of traffic control regulations.

Apprehension and disposition of stragglers, absentees, and deserters.

Collection and custody of prisoners of war.

Enforcement of police regulations among members of the military forces and in areas occupied by troops.

Cooperation with civil authorities on plans including those for police protection, black-outs, antisabotage activities, and the like.

Control of the civil population, including circulation of individuals and mass movements of refugees, when circumstances require.

Supervision of installations for refugees and the feeding of noncombatants, when necessary.

Criminal investigation activities and custody and disposition of offenders.

Coordination, within limits prescribed by the commander, of military police in subordinate units.

Recommendations as to location of straggler line and collecting points for prisoners of war.

Signal Officer. Adviser to the commander and staff on signal matters, including the location of command posts.

Preparation of routine and combat orders relating to signal communication.

Planning, installation, and supervision of the aircraft warning net, when so directed.

Preparation, publication, storage, accounting for, and distribution of codes and ciphers.

Determination of requirements, procurement, storage, and distribution of signal equipment and supplies.

Procurement and operation of signal maintenance and repair facilities.

Technical inspection of signal equipment, within limits prescribed by the commander, and recommendations relative to its care and utilization.

Technical supervision, within limits prescribed by the commander, of signal operations of the command, including coordination of the employment and of the training of signal agencies of subordinate units.

Supervision of the installation, maintenance, and operation of the signal system, including the message center of the unit.

Supervision of such activities pertaining to the signal intelligence, pigeon, and, except in Air Corps units, photographic services as affect the unit.

Examination of captured signal equipment.

Surgeon. Adviser to the commander and staff on all matters pertaining to:

(1) Health and sanitation of the command and of occupied territory.

(2) Training of all troops in military sanitation and first aid.

(3) Location and operation of hospitals and other medical establishments and of the evacuation service.

Supervision, within limits prescribed by the commander, of training of medical troops, including inspections.

Determination of requirements, procurement, storage, and distribution of medical, dental, and veterinary equipment and supplies.

Supervision, within limits prescribed by the commander, of the operations of elements of the medical service in subordinate units.

Preparation of reports and custody of records of casualties.

Examination of captured medical equipment.

Commanders of Attached Combat Units Having No Special Staff Representative. Commanders of attached combat units having no special staff representative act as advisers to the commander and his staff on tactical and technical matters relating to their units.

Adjutant General. Handling all official correspondence, except that pertaining to combat orders and instructions, in accordance with regulations and approved policies. In cases for which no policy has been established, he initiates action to secure a policy covering such cases.

Authentication and distribution of all orders and instructions, except those pertaining to combat operations.

Maintenance of the office of record for the headquarters.

Operation of the Army postal service in the unit. In divisions and certain higher units upon mobilization, a postal section is organized and operated by a designated postal officer under the supervision of the adjutant general.

Establishment of the Prisoner of War Information Bureau prescribed by the Hague Convention (GHQ and theater of operations).

Operation, in accordance with approved policies, of activities at the headquarters pertaining to:

(1) Classification of all individuals joining the command, their subsequent assignment, reclassification, and reassignment, their promotion, transfer, retirement, and discharge.

(2) Procurement and replacement of personnel.

(3) Decorations, citations, honors, and awards.

(4) Leaves of absence and furloughs.

(5) Education (exclusive of tactical and technical).

(6) Recreation and welfare and all other morale matters not specifically charged to other agencies.

Custody of the records of all personnel belonging to the command which are not kept in some subordinate unit.

Preparation and distribution of the station list.

Preparation and submission of reports on strength, casualties, captured matériel, prisoners of war, and incidental returns.

Supplying of blank forms, publications, and instructional matter furnished by the Adjutant General's Department.

Operation of office procedure as regards administrative matters, including recommendations as to similar arrangements in headquarters of subordinate units.

Chaplain. Adviser to the commander and staff in religious and moral activities of the command.

Supervision of the spiritual welfare of the command.

Conduct of religious services, including funerals.

Spiritual ministrations to the sick and wounded.

Correspondence with relatives of deceased personnel.

Coordination of the religious work of the various welfare societies.

Supervision and coordination, within limits prescribed by the commander, of the training and work of the chaplains of subordinate units.

Recommendations as to assignments and transfers of chaplains.

Providing the services of chaplains for units requiring them.

Preparation of estimates and allotment of funds for religious activities not specifically charged to other agencies of the command.

Preparation of reports relative to the religious and moral activities of the command.

Finance Officer. Adviser to the commander and staff on fiscal matters.

Payment of the command, and payments for hired labor, for supplies purchased or requisitioned, and for damages or claims.

Custody of financial records.

Custody and disbursement of all Government funds, including such special funds as the commander may direct.

Inspector General. Inspections and investigations as the commander may direct. For sphere of inquiry see AR 20-5, 20-10, 20-30, and 20-35.

Inspection of all commands, units, systems, transportation, installations, accounts, and nonmilitary agencies as required by the commander.

Judge Advocate. Adviser to the commander and staff, and to other members of the command in proper cases, on questions of law.

Supervision of the administration of military justice within the command.

Review and recommendation as to the action to be taken upon charges preferred for trial by, and records of trial of, military courts.

Officer in Charge of Civil Affairs (GHQ and other territorial commands when required). Adviser to the commander on matters pertaining to the administration of civil affairs in the theater of operations (FM 27-5).

Supervision of such agencies as may be established for the required control of civil affairs in occupied territory.

Quartermaster. Adviser to the commander and staff on quartermaster matters.

Determination of requirements, procurement, storage, and distribution of quartermaster equipment and supplies, including vehicles.

Procurement and disposition of real estate and facilities, including leasing.

Procurement and operation of quartermaster utilities, storage, maintenance, and repair facilities.

Operation of:

(1) Remount service.

(2) General service pool of labor.

(3) Salvage service.

(4) Graves registration service.

Transportation of troops and supplies by land, water, and commercial air means, except such as may be allocated to another arm or service.

Technical inspection of motor and animal transportation, and supervision of quartermaster activities in subordinate units within limits prescribed by the commander.

Examination of captured quartermaster equipment.

Special Staff Officers of Smaller Units. In brigades and smaller units, general and special staff duties merge into each other, and one staff officer frequently is charged with duties of both general and special staff nature. In some units the same officer performs the duties of more than one of the staff sections.

STAFF RECORDS, MAPS, AND REPORTS

Staff Records. A system of staff section records is essential in order to have information available for:

(1) Command decisions during operations.

(2) Higher headquarters.

(3) Historical record (AR 345-105).

The refinement of the system of making and keeping unit or staff records will vary with the factors of available time, opportunity, and personnel.

Office of Record. The office of record is that of the adjutant general or adjutant.

Staff sections temporarily retain copies of documents needed in their current work, returning them to the office of record when no longer needed.

JOURNAL

..... Journal ¹

Organization.....

From: (Date and hour)

To: (Date and hour)

Place

Time ²		Serial No.	Time dated ³	Incidents, messages, orders, etc.	Action taken ⁴
In	Out				

Plate 2. Form for Unit Journal.

NOTES

2. Refers to time of receipt or sending in this office.

3. Refers to time information originated, and thus calls attention to age of the information.

4. Following symbols may be used: M, noted on situation map; S, standard distribution at CP; T, information furnished troops.

officers, and absences from the command post of the commander or section chief. A brief synopsis of written messages or orders should be entered in the journal and the originals filed in the journal file. Oral messages or orders should be entered in full when practicable.

In corps and higher units and in divisions when the personnel of the staff section is adequate, each staff section keeps a journal of its activities. The assembled journals

of the staff sections should form a complete picture of the operations of the unit for a given period. In divisions, when the personnel of the staff sections is inadequate, two or more section journals may be combined.

In brigades and smaller units, a combined unit journal is usually sufficient and should be kept by the adjutant or plans and training officer or as directed by the unit commander. In highly mobile units such as armored units, it may be necessary for each staff section to keep its own journal.

The journal is closed daily or at the end of a phase or period as determined by higher authority.

The journal is a permanent record of the operations of the unit and is annexed to reports after action against the enemy (AR 345-105). Original entries should not be altered but supplemented when necessary by later entries.

Situation Maps. In corps and higher units, and in divisions when the personnel of the general staff sections is adequate, each general staff section keeps a situation map posted to date showing the dispositions and activities that concern the section. Data should be posted on the map as soon as received, after which the items should be entered in the journal. In divisions, when the personnel of the general staff sections is inadequate, a joint G-2—G-3 situation map and a joint G-1—G-4 situation map may suffice.

(1) In most brigades and smaller units, a combined situation map kept under the supervision of the unit executive is usually sufficient.

(2) In highly mobile units such as armored units, each staff section keeps its situation map up to date even while moving.

Situation maps showing the situation at a particular time are often prepared as appendixes to special or periodic staff reports to permit the written contents of reports to be reduced to a minimum.

Operation, Administrative, and Circulation Maps. Operation maps are prepared and issued by the G-3 (S-3) section.

Administrative and circulation maps are prepared and issued by the G-4 (S-4) section.

Reports. The character and scope of staff and unit reports will vary with the requirements of the commander or the higher headquarters at the time the reports are called for.

The merit of a report is not measured by its length. A concise presentation of important points usually is all that is required.

In divisions and higher units, each staff section prepares and submits such periodic or special reports pertaining to its activities as may be directed or required.

In brigades and smaller units, a single unit report prepared under the supervision of the executive is usually sufficient.

Reports on the situation or events will be of maximum usefulness to the commander, other staff sections, and higher headquarters when made as of a particular hour. Such a time might be toward the close of the day's heaviest fighting, as a basis for the commander's decision for night dispositions and a renewal of operations the following day, or whenever a change in the situation indicates that new decisions and new plans will be necessary.

The number of written reports required from subordinate units should be held to the minimum. Wherever possible, personal or telephone conferences should replace written reports.

Commanders may require reports from subordinate units at certain times; for example, a report may be required at a time in the early morning, noon, and near night-fall, regardless of the information available. Negative information may be valuable.

LIAISON

General. Liaison is the connection between units or other elements, established by a representative—usually an officer—of one unit who visits or remains with another unit. Its purpose is to promote cooperation and coordination of effort by personal contact.

Types. Liaison may be established between supporting and supported units; between adjacent units (lateral liaison); from subordinate to higher headquarters; and from higher to subordinate headquarters.

Between Supporting and Supported Units. Liaison between supporting and supported units, if established, is the function of the supporting unit.

Field artillery habitually establishes liaison with supported units for the primary purpose of obtaining information as to the needs for supporting fire. For example, liaison is established by direct support artillery battalions with the supported front line battalions and also with the regiment. (FM 6-20).

Liaison between other supporting and supported units is established when desirable.

Between Adjacent Units. Liaison between adjacent units in combat is established when desirable. If used, it may be directed by a higher commander or established on the initiative of adjacent commanders.

From Subordinate to Higher Headquarters. A subordinate unit may be directed to establish liaison with higher headquarters. Such liaison may be made routine by prescribed standing operating procedure.

From Higher to Subordinate Headquarters. The usual purposes of liaison from higher to subordinate headquarters are to obtain information, transmit orders, clarify the existing situation and orders, and receive and transmit requests for assistance.

This liaison is maintained when authorized by the higher commander.

Selection of Liaison Officers. The maximum effectiveness of liaison missions will be secured if the officer selected for this duty:

- a. Has the confidence of his commander.
- b. Is favorably known, either personally or by reputation, by the commander and staff of the unit to which sent.
- c. Has a sound and comprehensive knowledge of tactics.
- d. Possesses tact.
- e. Has had experience or training as a liaison officer.

Duties of Liaison Officers. *Prior to departure* the liaison officer should:

- (1) Become familiar with the situation of his own unit and so far as practicable with that of the unit to which sent.
- (2) Ascertain definitely his mission.
- (3) Insure that arrangements for communication (signal and transportation) are adequate.
- (4) Obtain credentials in writing unless obviously unnecessary.

On arrival at headquarters to which sent, the liaison officer should:

- (1) Report promptly to the commander, stating his mission, and exhibiting his directive or credentials, if in writing.
- (2) Offer his assistance to the commander, if appropriate.
- (3) Arrange for the transmission of messages he may be required to send.
- (4) Arrange to obtain information required by his mission.
- (5) Familiarize himself with the situation of the unit to which sent.

During his liaison tour the liaison officer should:

- (1) Further harmonious cooperation between his own headquarters and the one to which sent.
- (2) Accomplish his mission without interfering with the operations of the headquarters to which sent.
- (3) Keep himself informed of the situation of his own unit and make that information available to the commander and staff of the unit to which he is sent. (Such action is of special importance to liaison officers of attached or supporting units.)
- (4) Keep an appropriate record of his reports.
- (5) Report on those matters within the scope of his mission.

(6) Advise the visited unit commander of the contents of reports to be sent to his own headquarters.

(7) Make prompt report to his own headquarters if he is unable to accomplish his liaison mission.

(8) Report his departure to the visited unit commander on the completion of his mission.

On return to his own headquarters the liaison officer should:

(1) Report on his mission.

(2) Transmit promptly any requests of the commander from whose headquarters he has just returned.

Duties of Sending and Receiving Headquarters. The commander of the headquarters sending a liaison officer should:

(1) Give the liaison officer definite and detailed instructions, in writing if appropriate, as to the liaison mission.

(2) Inform the liaison officer of the commander's plans, especially as they affect the unit to which he is to be sent.

(3) Insure that adequate facilities are available for communication (signal and transportation means) between the liaison officer and the sending headquarters.

The commander of the headquarters receiving a liaison officer should:

(1) Give the liaison officer all assistance possible, compatible with the normal operations of the headquarters.

(2) Keep the liaison officer informed as to the plans for future employment of the unit visited.

(3) Give the liaison officer free access to those staff sections or troops having data pertinent to the liaison mission.

The contact established by liaison officers does not relieve commanders from the responsibility of keeping the next higher, lower, and adjacent commands informed of the situation through normal channels.

CHAPTER VI

SUPPLY AND EVACUATION OF LARGE UNITS

Scope. This chapter deals with the problems of supply and evacuation of large units within the combat zone. The system of supply of small units is presented in detail in Part III, of this volume. The vast problem of procurement of supplies and adequate provisions for the mobilization of matériel and industrial organizations essential to wartime needs is made the specific function of the Assistant Secretary of War, under the direction of the Secretary of War, by the provisions of the National Defense Act of 1916, as amended. The purpose of this chapter is to define and illustrate this vital phase of military operations as it must be accomplished in the field with sufficient detail to enable the reader to visualize the problem and its methods of accomplishment.

The modern army is dependent to an amazing degree upon a multitude of mechanical devices, motor transportation, highly specialized arms and equipment. An army consumes vast quantities of supplies of many kinds such as food, gasoline, and ammunition. Its equipment is subject to destruction in battle, to unusually severe wear and tear, to loss from many causes. Notwithstanding these obvious difficulties, the army must enter upon a campaign without shortage of essential equipment. During combat the vital requirements must be replaced substantially as rapidly as they are consumed. When the battle is over the army must be refitted. These operations provide a tremendous problem for the supply services.

The enormity of the undertaking may be better visualized by considering the supply and evacuation requirements which confront a war strength reinforced corps as they are now estimated for the *first day* of attack of a position.

Tons of rations required	359
Tons of small arms ammunition required	730
Tons of all other ammunition required	3768
Tons of Class II, III, IV supplies required	898
Casualties to be evacuated	3400

Considering the factor of tonnage alone, six trains hauling approximately 1000 tons each must be brought into the corps area and unloaded; the supplies have to be placed in depots, other supply points, or distributing points so that they will flow forward to the troops as they are required. The components of these tons and trainloads must be visualized as a multitude of separate items, each of which must be forwarded in the necessary quantities and must reach the unit for which intended in time to meet its requirements.

Modern armies have been able to attain this objective. It requires training of supply specialists, the development of the necessary facilities, and understanding by the using services of the system adopted so that they may supply the necessary information in time to permit the service of supply to operate efficiently. Perhaps the greatest requirement is foresight so that future needs are properly anticipated. Not the least important factor in this foresight is appreciation of the scope and importance of the basic problem.

It is a principle that the necessary supplies must be made available to support the commander's tactical plan. If this cannot be accomplished for any reason whatever the commander must be informed of the fact as it must affect his further actions. It requires careful estimate of the requirements well in advance of a projected, large-scale operation. The supplies must be obtained and placed in depots for distribution. As required by the troops, they must be forwarded and distributed. Breakdown in the supply service may have a disastrous effect upon the outcome of battle.

General Principles Governing Supply and Evacuation. Each commander of a unit in the chain of supply is responsible for providing adequate supplies and replacements (men and animals) for its own next subordinate units *at the time and place needed*. Anxiety as to supplies must not divert the attention of the troops from their tasks as concerns action with the enemy. For example, the division commander is responsible that his

infantry regiments, artillery battalions, and other organic or attached units are furnished with their requirements. Thus the impetus of the movement of supplies and replacements is said to flow from the rear to the front.

The same principle applies to the evacuation of sick or wounded men and animals. The higher unit assumes responsibility of relieving the next lower unit of its casualties.

Combat units must be free from the burden of excessive supplies. Stockage of supplies must be echeloned in depth to provide against shifting tactical situations and interruptions in the rate of delivery.

Whatever the actual system of supply adopted in a particular situation, it must be flexible. The conditions of battle are subject to constant change. The fact that a division occupied a certain location under a known situation at the time the request for supplies was originated does not mean at all that the location or situation will necessarily be the same at the time of delivery. The method adopted must be flexible so that these changing conditions will not stop the flow. *Supplies must find the troops, not the troops find the supplies.* Further, the plan must be simple. This much overworked term is subject to various interpretations as the easy way to accomplish any task is not usually apparent to the unskilled or the novice. Certainly the plan must avoid complexities.

Operation of the Supply System. The commander of a military unit is responsible for the operation of his system of supply just as he is responsible for all other phases of its operation. In the execution of this responsibility he is assisted by the heads of the supply services within his organization and by the G-4 section of his general staff.

In the infantry division the following officers of the special staff are operating agencies for supplies pertaining to their own branch:

The Division Quartermaster.

The Division Surgeon.

The Division Signal Officer.

The Division Chemical Warfare Officer.

The commander of the artillery of the division.

Other representatives of supply arms or services who may be provided.

The G-4 section of the general staff, among other allied responsibilities, is charged with making certain that the plan of supply proposed by the operating agencies will be adequate to the commander's tactical plan; that the operating agencies are coordinated among themselves as to location of installations, priorities on delivery, and use of means of transport and labor; the section makes certain that the necessary adjustments are made in the basic plan to meet changing situations. Finally, the G-4 of a command is responsible to the commander that needs are foreseen and provided for and that the system "works."

Classification of Supplies. For purposes of convenient reference, supplies required by troops in the field are classified as shown below. It will be noted that items furnished by two or more supply services may be placed in the same classification.

Class I. Those items such as rations, forage, and illuminants which are consumed at an approximately uniform daily rate irrespective of combat operations or terrain and which do not necessitate special adaptation to meet individual requirements. These supplies are usually forwarded on an automatic basis (see definitions below). Calls for Class I supplies are made by the daily telegram. The depots make up the shipment as required. It is loaded on the daily train and dispatched through the regulating station to the proper railheads. At the railhead distribution is effected by the quartermaster.

Class II. Those authorized articles of equipment which, though consumed at an approximately constant rate, are for the personal use of the individual and necessitate special arrangements to meet individual requirements; examples are clothing and gas masks. These items are usually made available in the form of credits in designated depots on which units may draw as required. Unit supply officers submit approved requisitions to the proper supply service of the next higher echelon in the chain of supply where, if available, they are filled from stock. If requisitions are filled from the depot, shipments are made up and dispatched through the regulating station to the proper army supply establishment as outlined above for Class I supplies.

Also those authorized articles of equipment for which allowances are established by

Tables of Organization and *Tables of Allowances*, such as arms, and engineer, medical, ordnance, quartermaster, and signal equipment, including motorized and animal-drawn vehicles. Delivery is made on the same basis as that described for Class I supplies.

Class III. Motor fuels and lubricants (air and ground).

Class IV. Those articles of supply which are not covered in *Tables of Allowances* and the demands for which are directly related to the operations contemplated or in progress, such as fortification materials, construction materials, and machinery. These supplies are furnished on a requisition basis as Class II supplies.

Class V. Ammunition.

Definitions. An understanding of the terms defined below is necessary for the further study of the system of supply.

Theater of war. Areas of land and sea which are or may become directly involved in the operations of war. The part of this area under the control of each belligerent is usually divided into a zone of the interior and one or more theaters of operation.

Zone of the interior. That part of the national territory not included in the theater of operations. The functions of the several agencies of the zone of the interior, in time of war, are to supply the commander of the field forces with the means necessary for the accomplishment of his mission.

Theater of operations. That part of the theater of war in which operations are conducted. It is divided for the purposes of combat and for decentralization of administration into a communications zone and a combat zone (see plate 1).

Communications zone. That portion of the theater of operations containing the principal establishments of supply and evacuation, lines of communication, and other agencies required for the continuous service of the forces in the theater of operations.

Combat zone. The forward area of the theater of operations. Each army, corps, and division area covers the zone of operations of the unit to which it pertains and is under the control of the commander thereof.

Automatic supply. A process of supply under which deliveries of specific kinds and quantities of supplies are moved in accordance with a predetermined schedule. *Daily automatic supply* means that certain supplies are dispatched daily to an organization. Rations are usually delivered in this manner. The daily telegram is the basis for determining quantities to be delivered.

Daily telegram. A report of strength made by a division or higher unit which serves to determine the unit's daily requirements of Class I supplies.

Credit. An allocation of a definite quantity of supplies, placed at the disposal of the commander of an organization for a prescribed period of time, on which he may draw as required. The amount of the credit is an important factor in determining the extent of operations in which a unit may engage. It is futile to undertake an extensive military operation unless the required supplies in the form of credits are available to draw upon as needed.

Requisition. An authoritative, original demand for supplies required. The quantity called for in a requisition should be considered in connection with the credits and future requirements.

Call or draft. A demand for the delivery of supplies under the terms of a credit.

Priorities. Definite rulings which establish, in the order of time, the precedence of shipments and the movements of rail, road, and water transport. Ammunition, for example, may be forwarded ahead of all other supplies because of the urgency of tactical requirements.

Day of supply. A yardstick used by the higher echelons of the staff for determining levels, credits, and transportation requirements. It expresses collectively, in pounds per man per day, the estimated average expenditure of the various items of supply, per day, in campaign.¹ The amounts are determined by experience, the size and composition of the forces involved, the character of the operations, the nature of the enemy, and prevailing climatic conditions.

¹According to newspaper accounts of the movement of the British Army to France at the beginning of World War II, it was necessary to move ½-ton per man per day across the channel to serve the expected requirements of the expedition.

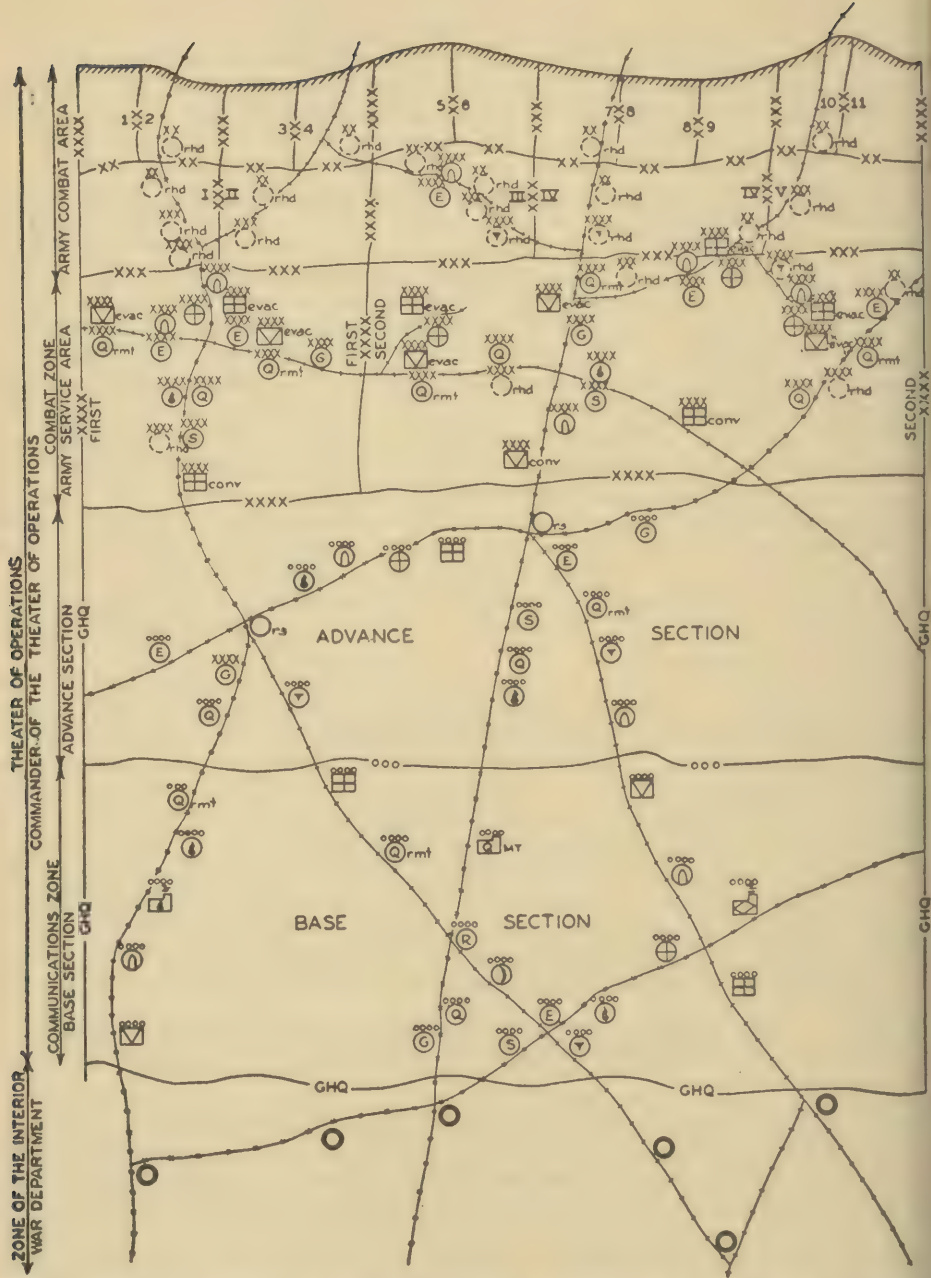


Plate 1. Schematic Diagram of the Organization for Supply in a Theater of Operations

Day of fire. An arbitrary unit of measure for ammunition expenditure expressed in rounds per piece. The character of the operations is the basis of this estimate. It is subject to change according to experience.

Depots and depot classifications. A depot is an establishment for the reception, storage, classification, issue, or salvage of supplies or for the reception, classification, and forwarding of replacements. The designation of a depot is that of the unit establishing it, followed by the kind of supplies stocked. For example: "First Army Ammunition Depot No. 1"; "Communications Zone General Depot No. 3"; "First Army Replacement Depot".

A *general depot* affords accommodations for the operation of two or more supply arms or services. A *branch depot* pertains to a single supply arm or service. General or branch depots may be *base*, *intermediate*, or *advance depots*, depending upon their location in the communications zone. *Army depots* are branch depots located in the combat zone under the jurisdiction of the army. A corps operating independently will usually find it necessary to establish branch depots similar to army depots; these are designated *corps depots*.

Regulating station. This is a traffic-control agency established on the lines of communication through which movements of supplies are directed and controlled by the commander of the theater of operations. Usually, one is provided for each army or similar command. In an emergency, motor transportation will supplement rail transportation, and the regulating officer must be prepared to substitute motor service if rail transport is disrupted.

Lines of communication. These include the network of railways, waterways, and roads which lead into the combat zone from the supply and evacuation establishments located in the communications zone and the zone of the interior.

Railhead. A point on a railway, designated as such, which provides rail accommodations for the supply of troops whom it is designated to serve. It marks the forward limit of rail transportation within the combat zone. It must be located convenient to the troops served, beyond the maximum effective range of enemy artillery, and have sufficient siding capacity to accommodate at least one unit section of the daily train. Generally not more than two divisions, or one division and corps troops, should be served from any one railhead. *Truck head* and *navigation head* are similar terms.

Daily train. The railway train arriving daily at the railhead with Class I and other supplies for the troops whom the railhead serves. A *unit section* is made up for each division. It is dispatched from the regulating station. It should arrive at or before midnight to allow time for unloading and delivery under the cover of darkness.

Supply point. A generic term used to include depots, railheads, distributing points, air bases, and dumps. The term "refilling point" is no longer in use.

Distributing point. A place at which supplies are distributed to trains of the troops. Separate distributing points are usually established for Class I supplies and small-arms ammunition. Distributing points for other supplies, such as artillery ammunition, water, and engineer supplies, are established as required. Distributing points for Class I supplies, water, and small-arms ammunition must be convenient to the troops served but should be beyond the range of hostile small arms in a location with concealment and cover.

Dump. A temporary stockage of supplies within the area of corps, divisions, or smaller units. Dumps are designated by the identity of the unit establishing them and the class of supplies therein; such as, "1st Infantry Ammunition Dump" or "1st Division Class I Supply Dump."

Control point. An agency established by a unit at a convenient point on the route of its trains where information and instructions are given and received to facilitate and regulate supply.

Train. The train of a unit is that portion of the unit's transportation with its accompanying personnel which operates under the immediate orders of the unit commander in supply, evacuation, and maintenance. The designation of a train is the same as that of the unit, as "1st Infantry Train." A train may be subdivided according

to the service in which it is engaged; for example, "Ammunition Train, 1st Infantry," "Kitchen Train, 1st Battalion, 1st Infantry," or "Medical Train, 1st Battalion, 1st Field Artillery."

Straggler line. A line usually located close in rear of the light artillery positions along well defined terrain features. On or in rear of this line military police are stationed to apprehend stragglers moving to the rear. A *straggler collecting point* is a location on the straggler line at a place which is likely to be used by stragglers. They are returned to their organizations from this point.

Prisoner of war collecting points. A place where prisoners of war are delivered by organization guards and turned over to the military police for custody.

Prisoner of war enclosure. A place for safe-keeping and confinement of prisoners war pending their evacuation to the rear.

Traffic control post. A critical point on a highway at which one or more men are stationed to regulate traffic.

Traffic patrol. One or more men mounted on horses, bicycles, or motorcycles for the purpose of patrolling roads between traffic control posts.

Officers' control station. One or more officers and a detachment of military police detailed to control and regulate traffic within a critical area, such as a town, defile, or multiple road intersection, where immediate action by a responsible authority is necessary.

Evacuation. The process of clearing the combat zone of battle casualties in both men and animals.

Collecting station. A place at which casualties are assembled from unit aid stations, frequently by litter carry, where they are examined, given the necessary treatment, fed, and sorted for return to their units or removal to the hospital station (or clearing station). Its distance from the front line will usually vary from 1500-3500 yards. It should be on the natural line of drift of wounded, be protected from hostile small-arms fire and observation, and on a practicable ambulance route. Water, wood, and shelter should be available.

Clearing station. The division medical installation where sick and wounded are assembled from collecting stations, sorted, treated if necessary, and turned over to the army for further evacuation. (Formerly called "hospital station.")

Evacuation hospital. A hospital through which all casualties pass in their transit from the combat zone to the communications zone. They are established in groups of two or more behind each corps at from 10-16 miles in rear of the battle front along railroads leading to the communication zone hospitals and along roads which lead forward to the division areas. Casualties are moved by ambulance from the hospital stations of divisions to the evacuation hospital.

Surgical hospital. A hospital assigned to the immediate support of division hospitals, from which the more serious cases or non-transportable cases are received.

Hospital train. A train which is specially equipped and supplied for the purpose of moving patients from evacuation hospitals to the communications zone.

Reserve supplies. Supplies which are accumulated in depots in excess of immediate needs for the purpose of insuring continuity of an adequate supply under any condition of campaign. The stockage of depots for future needs and the level of supplies of all categories to be maintained are important questions of decision. These supplies are classified as *base, battle, unit, and individual*.

Base reserves. Supplies accumulated and stored in depots, for the purpose of establishing a general reserve, under the control of the commander of the theater, for the theater of operations as a whole.

Battle reserves. Supplies accumulated in the vicinity of the battlefield in addition to unit and individual reserves. They are often accumulated in anticipation of a particular operation. If these supplies are left on freight cars so as to be quickly moved they are sometimes referred to as *rolling reserves*.

Unit reserves. The prescribed quantities of supplies carried as a reserve by a unit. Unit reserves of rations, ammunition, and gasoline are maintained as regular procedure. They insure supply during minor emergencies when for any reason the supply service is interrupted.

Individual reserves. Supplies carried on the soldier, animal, or vehicle for his or its individual use in an emergency.

"Rolling" reserves. The prescribed load of supplies carried on trains of the corps, division, and subordinate units. These supplies may be placed in dumps to obtain release of transportation for other purposes. Also reserves stocked on railway trains.

The Division as a Link in the Supply System. The division is the basic supply unit for combat troops. The field army is the principal administrative (and supply) unit in the combat zone. The army corps, when part of an army, is not a link in the chain of supply, evacuation, and replacements for its divisions except requisitions for and allocations of ammunition and personnel. In accordance with the principle that each commander is responsible for the supply of the components of his force, the impetus coming from the rear, the division receives and distributes the supplies which are forwarded to it by the supply agencies under the control of the field army commander. Plate 1 illustrates in diagram the location and nature of these supply agencies. The division commander is responsible for the administration, supply, and evacuation of his force to the same extent as for its action in battle.

The delivery and distribution of supplies within a division whose trains are motorized are effected by hauling either in regimental or divisional transportation from army supply points to the using troops. Normally, supplies are not transferred to other trucks or placed in dumps from the time they are received from the army supply points until they are delivered to the using troops. Based upon consideration of the tactical situation, the reserves carried, the probable expenditure rate, the distances involved, the routes available, and the restrictions imposed by higher authority, the division commander determines the degree of responsibility that will be placed on subordinate commanders for effecting resupply with their own transportation. The division commander must insure that the requirements placed on subordinate units for the utilization of their transportation in effecting resupply are not excessive. That part of the hauling requirement which is not delegated to subordinate commanders must be executed by transportation of the division quartermaster battalion or quartermaster regiment (in the square type division). On the other hand, the transportation of the division quartermaster unit constitutes the division reserve, which is inadequate to meet in full the requirements for resupply of the division during a protracted period. The reader should understand that the division commander may prescribe that subordinate commanders will provide for resupply with their own unit train; or that resupply will be handled in its entirety by trucks of the division quartermaster unit; or that it may be done by unit trains, in part, and by the quartermaster unit, in part.

Pooling of Truck Transportation. While certain trucks are assigned prescribed loads, it does not follow that their use is limited to transporting such loads. Except for motor vehicles issued as an aid to the movement of active weapons, such as prime movers or weapon carriers, all of the trucks of a unit are considered by commanders as a pool of transportation to be used as required. By this means maximum flexibility and capacity are obtained.

Replenishment of Gasoline and Oil. The modern military force of large size requires huge quantities of gasoline and oil. It is obvious that the consumption rate per day must vary within the widest limits, depending upon distances moved, distance to supply points, and the total truck-miles of transportation required. Accordingly, no fixed quantity can be specified as a day of consumption of a unit.

A reserve of gasoline and oil in containers is carried in each unit. As far as practicable, initial distribution of this reserve is made to each vehicle. This constitutes the entire division reserve. Each vehicle sent to an army supply point replenishes its supply en route at some convenient gasoline supply point established by the army. Vehicles remaining in the forward areas are resupplied by exchanging empty containers for full ones brought forward by regimental or divisional transportation.

Procedure to Obtain Class I Supplies (Rations, Forage, and Illuminants). The following rations are prescribed for field service (Circular 88, War Department, November 7, 1939).

Field Ration A: Corresponds to the garrison ration and is perishable.

Field Ration B: Same as A but with nonperishable components.

Field Ration C: Previously cooked ration; 6 cans per individual ration, 3 of meat and vegetables, and 3 of crackers, sugar, and coffee.

Field Ration D: Three 4-ounce chocolate bars per individual ration.

The A ration will normally be issued daily from Class I railheads to all divisions and other units not actively engaged with the enemy. In battle, one of the nonperishable rations or combinations will usually be issued to the units engaged.

Class I supplies are usually furnished on an automatic basis. Daily strength reports are submitted by each company and battery to the regiment where they are consolidated and forwarded to the division headquarters. The sum of these reports is the strength of the division and is the number of officers and men, and animals, for whom Class I supplies are to be received.

The division quartermaster prepares and sends a daily telegram stating the strength to the army quartermaster. This information from all the components of the army is then furnished by telegram to the quartermaster supply officer at the regulating station. This officer notifies the appropriate depots in the communication zone or zone of the interior to forward the required supplies.

The depots make up the required shipment as required, based solely on the strength reports, forwarding ration components and other Class I supplies according to definite schedules. It is noteworthy that mess officers in the field have no choice whatever of the ration components they will receive; rations are sent forward sufficient for the number of men reported in the strength report. Balancing the diet and variations in the ration components are determined at the point of origin of the shipment. The shipment starts forward, usually by rail, from the depot and passes through the regulating station en route to its final destination.

At the regulating station cars are assembled into unit sections, one section, for example, being made up for each division. This section becomes the daily train. It is dispatched from the regulating station in time to permit arrival at the division railhead at a prearranged hour. This time of arrival is usually after dark and before midnight so that the train can be unloaded and the supplies distributed to the troops before daylight.

At the railhead the daily train is unloaded and the supplies are distributed by the division quartermaster service. This may be accomplished by different methods. *Unit distribution* consists of loading the supplies for a unit, a regiment for example, on trucks of the division train; they are then hauled to the distributing points for Class I supplies established for the particular units concerned. A regiment of infantry may secure its supplies from the same distributing point, which is usually located at the bivouac of the unit trains. At each distributing point the trucks are unloaded, the supplies separated for each subordinate unit such as a company and loaded into trucks of the unit train for final delivery. Rations are sent directly to the kitchen sections. *Railhead distribution* is a second method. In this method the railhead becomes the distributing point and supplies are not moved in trucks of the division train. The supplies are unloaded at the railhead, separated into loads for each subordinate unit, and secured at that point by the unit trains. Delivery to the troops is then accomplished. Combinations of these methods may be used, some subordinate units being supplied by unit distribution while others use railhead distribution. The distance of the railhead from the troops and the availability of transportation are determining factors in the selection of method.

Reserve Stockage of Supplies. The ideal flow of supplies, if it were possible of attainment, would place in the hands of troops today the things they will consume today. With such an arrangement the slightest interruption or miscalculation would result in immediate shortages with the troops. A reserve of supplies is necessary to provide against interruption in delivery, such as might result from enemy bombing operations, and to provide available supplies in quantities beyond the hauling capacity of a unit during an operation.

The quantities of supplies held in reserve stockage depends upon the nature and extent of the proposed tactical operation, the capabilities of the enemy to interrupt the

normal bow of supplies, the distance to supply depots, and other factors. The amount and kind of reserve supplies are decisions to be made by the commander. If too little a reserve is maintained hardship may result, as a minimum, and disaster as a maximum. On the other hand, if too great quantities are stocked the unit loses flexibility in movement, excessive manpower is consumed in loading and unloading vehicles, and in the event of a sudden withdrawal under hostile pressure large quantities of valuable stores must either be destroyed or abandoned to the enemy.

The ration reserve to be carried by individuals and on unit trains as a prescribed load is announced by the division commander. The rations within a division would rarely exceed three in number. For example: one ration issued to the kitchens with which to prepare the next three meals, one ration in reserve, transported on unit trains; and one ration retained under the control of the division quartermaster.

The reserve of gasoline and oil, as discussed above, is carried by each vehicle in extra cans.

The reserve of ammunition is provided by issue of complete loads to combat units and vehicles, by dumping of loads of certain ammunition-carrying vehicles in areas convenient to combat units, and the return of these vehicles thus emptied to army supply points for additional quantities.

The problem of estimating the kind and quantity of supplies required for an extensive operation of a large force is a responsibility of the commander. He must reach the decision by a far-sighted analysis of all the factors which may confront his subordinate units.

The supply of small-arms ammunition is a responsibility of the division ordnance officer. Using transportation and labor from the division quartermaster regiment or battalion, ammunition is obtained from supply points established by the army or independent corps. It is then transported to small-arms ammunition distributing points, usually established in rear of each brigade and conveniently located with respect to the positions of troops. The trains of units secure loads at these points as they are required. Units with motorized trains may secure ammunition direct from the supply point. Issue of ammunition to the troops becomes a responsibility of regimental commanders as soon as it has been turned over to them at the distributing points. This phase of delivery is a function of battalion or regimental supply sections.

Supply of artillery ammunition is a direct responsibility of the commander of the division artillery. He has an ammunition train for the purpose. Ammunition is obtained from artillery ammunition supply points which are established by the army or independent corps. It may be delivered direct to the batteries, or distributing points may be established in convenient locations where unit trains obtain it as required.

Anticipation of quantities of ammunition required for a projected operation is a vital consideration. Battle reserves may be built up in anticipation of peak needs at depots and at supply points. Extra ammunition may be issued to the troops, ammunition carrying vehicles may dump their loads in convenient locations and then be refilled. Foresight is required to anticipate the requirements and to provide the necessary stockage in advance depots so that delivery to the troops may be accomplished rapidly. In this phase of planning considerable use is made of the units established by the *day of fire* and *day of supply* of ammunition and other supply requirements, respectively. While these computations are valuable chiefly in determining tonnage, depot capacities, and number of trains required, they are important for large units. These figures are subject to constant revision to accord with experience.

Procedure to Obtain Other Supplies. Other supplies are obtained on approved requisition through unit supply officers. Heads of supply services of the division either fill the requisition from their own restricted stockage or forward it to higher headquarters. After approval, the requisition is then sent to the appropriate depot or supply point where it is handled by the unit concerned. *Engineer distributing points* may be established in locations convenient to the troops for distribution of large quantities of tools or materials. Medical supplies are procured by the service company of the medical regiment or battalion from medical depots of higher echelons and distributed to medical units, including

attached medical personnel with the regiments. Water, where practicable, is obtained locally and chlorinated as a matter of protection. Whenever necessary because of inadequate local supplies of potable water, *water distributing points* are established and operated by the division engineer regiment or battalion. From these points water containers of units of the division are filled.

Reinforcing units to the division are supplied by the division, responsibility resting upon the division commander to the same extent as for his organic components.

Procedure for Evacuation of Casualties. Casualties are first assembled at *aid stations* of the regiment or battalion, by litter if necessary, by medical personnel attached to regiments. From the aid stations, after the administration of the immediate requirements of medical care, they are transported to *collecting stations* by litter, by ambulance, or by walking. From the collecting stations they are moved by ambulance to the division clearing station. Division clearing stations are evacuated (cleared of patients) by medical units of the army of the independent corps.

CHAPTER VII

LEADERSHIP¹

The Individual in War. Man is the fundamental instrument in war; other instruments may change but he remains a constant factor. Unless his behavior and elemental attributes are understood, gross mistakes will be made in planning operations and in troop leading.

The *conduct* of the average man in battle is governed more by instinct than by reason. By instinct he is gregarious and prefers to fight in the group. He is beset with fear of the unknown, especially at night and when alone, and therefore seeks security in the group. He readily accepts symbolic ideals implanted by tradition and national culture and will fight for these ideals when he is aroused. His instinct of self-preservation will induce him to flee from danger but he is deterred from flight by the disgrace he feels in the eyes of his comrades. He wants to earn their respect and esteem as measured by the standard of military conduct accepted by the group. In the training of the individual soldier, the essential considerations, therefore, are to integrate the individual into a group and to establish for that group a high standard of military conduct and performance of duty.

War places a severe test on the *moral stamina* and *physical endurance* of the individual. It is not sufficient that he be well armed and equipped. Not only must the individual soldier be physically hardened, but he must be qualified to march, to use his weapons, and to care for himself and his transportation in the field.

The individual soldier must be fortified by *discipline* which is based on a high ideal of military conduct. This discipline must cause every man to have a horror of the disgrace that will be visited upon him and his unit if he succumbs to fear and endangers his comrades. An endeavor to dominate the instinct of self-preservation by the fear of a greater terror is resorted to only in extreme cases and then primarily for its salutary effect on the members of the group. As a rule it is far better to dominate demoralizing influences by inculcating in the individual a proper sense of duty, a conscious pride in his unit, and a feeling of mutual obligation to his comrades in the group.

In spite of the advances in technique, the worth of the *individual* man is still decisive. His importance has risen due to the open order of combat. Every individual must be trained to exploit a situation with energy and boldness, imbued with the idea that success will depend upon his action.

The dispersion of troops in battle caused by the influence of modern weapons makes control more and more difficult. Modern combat, therefore, requires more than ever a strong cohesion within a unit in order to give it a *sense of unity*. This cohesion is promoted by good leadership, pride in the accomplishments and reputation of the unit, and by mutual confidence and comradeship among its members.

Troop Leading. *Troop leading* in combat, regardless of the echelon of command, calls for cool and thoughtful leaders with a strong feeling of the great responsibility imposed upon them. They must be resolute and self-reliant in their decisions, energetic and insistent in execution, and unperturbed by the fluctuations of combat.

Example of Leadership. Troops are strongly influenced by the example and conduct of their commissioned and noncommissioned leaders. Will power, self-confidence, initiative and disregard of self will enable a leader to master the most difficult situation. A bold and determined leader will carry his troops with him no matter how difficult the enterprise. Mutual confidence between the leader and his men is the surest basis of discipline in an emergency. To gain this confidence, the leader must find the way to the hearts of his men. This he will do by acquiring an understanding of their thoughts and feelings, and by showing a constant concern for their comfort and welfare.

Combat Value of Units. The *combat value* of a unit is determined by the soldierly qualities of its leader and members and its "will to fight." An outward mark of this combat value will be found in the set-up and appearance of the men, in the condition, care, and maintenance of their weapons and equipment, and in the readiness of the

¹ *The Officer's Guide*, Military Service Publishing Company, has abundant material on this subject.

unit for action. Superior combat value will offset numerical inferiority. The greater the combat value of the troops, the more powerful will be the blow struck by the commander. Superior leadership combined with superior combat value of troops constitutes a reliable basis for success in battle.

Importance of Discipline. A hastily or poorly trained unit is likely to fail in a critical moment due to demoralizing impressions caused by unexpected events in combat. This is particularly true in the first engagements of a unit. Therefore, training and discipline are of great importance. Every leader is obliged to take energetic action against indiscipline, panic, pillage, and other disruptive influences. *Discipline* is the cohesive force that binds the members of a unit and its strict enforcement is a benefit for all. Its constraint must be felt not so much in the fear of punishment which it evokes as in the moral obligation it imposes on the individual to heed the common interest of the group.

Relations of the Commander with His Troops. A commander must live with his troops, and share their dangers and privations as well as their joys and sorrows. By personal observation and experience he will then be able to judge their needs and combat value. A commander who unnecessarily taxes the endurance of his troops will only penalize himself. The expenditure of combat strength must be in proportion to the

ESSENTIALS OF TROOP LEADING

1. Ability to reach a logical decision and sound plan. (Estimate of the Situation.)
2. Ability to transmit his decision and plan to his subordinates in the form of clear and simply expressed orders. (Issue of orders.)
3. Possession of the strength of character and knowledge of human relationships to force the execution of his orders. (Supervision.)

objective to be attained. Impossible demands only undermine the morale of troops and destroy their confidence in the leader.

Comradeship among officers and men is to be fostered by every available means. The strong and the capable must encourage and lead the weak and less experienced. On such a foundation, a feeling of true comradeship will become firmly established and the full combat value of the troops will be made available to the higher commander.

Acceptance of Responsibility. A willingness to accept *responsibility* is the foremost trait of leadership. This willingness should not, however, manifest itself in a disregard of orders on the grounds of probably having a better knowledge of the situation than the higher commander. Independence must not be confused with personal caprice.

Officers and men of all grades are expected to exercise a certain independence in the execution of tasks assigned to them and to show initiative in meeting situations as they arise. *Every individual from the highest commander to the lowest private must always remember that inaction and neglect of opportunities will warrant more severe censure than an error of judgment in the choice of the means.*

Morale and Unity. A wise and capable commander will see that the men assigned to the component groups of his unit are compatible and the composition of the groups is changed as little as possible. He will provide each group with a leader in whom its members have confidence. He will so regulate the interior economy of the unit that all groups perform the same amount of work and enjoy the same amount of leisure. He will see that demonstrated efficiency is promptly recognized and rewarded. He will set before all a high standard of military conduct and apply to all the same rules of discipline.

Good morale and a sense of unity in a command cannot be improvised; they must be thoroughly planned and systematically promoted. They are born of just and fair treatment, a constant concern for the soldier's welfare, thorough training in basic duties,

comradeship among men, and pride in self, organization, and country. The establishment and maintenance of good morale are incumbent upon every commander and are marks of good leadership.

The Decision. All commanders must reach their decisions by a logical process of thought. The process is called the "estimate of the situation." Prior to contact, or the beginning of a planned operation to be executed at a later time, there may be opportunity for a lengthy, time-consuming, painstaking analysis in which is considered all of the factors which can affect the outcome. A commander will compare each possible action which he can adopt, within the sphere of his mission, with each enemy reaction. Finally he will arrive at his decision which will include *what* the command as a whole will do, *when*, *where*, and *how* it will do it. Illustrative of a decision is the following: "To attack without delay enveloping the hostile south flank from the vicinity of Jonesville to seize the high ground east of Smithton.

"Line of departure: Highway 22.

"Boundary between brigades: * * * * *

There is no room for vacillation, for hunches, for "snap" judgment. All of the factors must be determined, weighed, analyzed, and accepted or rejected. It culminates in the decision.

In the heat of battle, commanders will rarely have time for such a detailed process prior to announcing the action to be taken. But the necessity for a thorough estimate is in no way reduced. Under these conditions each officer and man "lives" with the situation. The commander must be aware of the location and situation of his units. He must obtain and evaluate information of the enemy. He must be alert to each possible hostile threat and eager to exploit each enemy weakness. Foreseeing all possibilities he must have in mind tentative plans in constant development to meet each change in the situation. Under these conditions the announcement of a decision and plan to meet a sudden threat or exploit an opportunity is a matter of a brief period, perhaps a few minutes, even a few seconds. See Chapter VII, Part III.

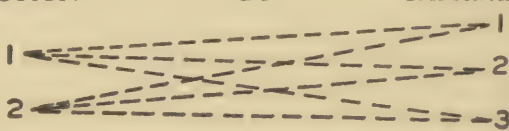
The Plan. After the commander has reached his decision he must evolve the plan by which it is to be executed. It will direct the essential tactical operations to be undertaken and make disposition of the major combat elements. It includes the basic tactical decision, supplementary decisions regarding unit tactical missions, intelligence and security measures, and administrative matters necessary to give effect to the decision. Definite missions are assigned to the principal components of the force. In an attack, for example, the plan may include the designation of the units to make the holding attack, the main attack, and the reserve with its initial location. Many other details may be included, depending upon the desires of the commander, the state of training of the troops, the skill of his staff and subordinate commanders, and the degree of teamwork which has been developed between the components of the force.

The commander who has no staff must of necessity prepare all of its details. But when a trained staff is available he may utilize it to develop it in final and complete form. When this process is followed the commander issues a directive to the staff, or to his chief of staff, in which he states the decision and outline of his plan. The staff will then complete it and, subject to approval of the commander, prepare and issue orders to the components of the force.

Orders. The will of the commander as expressed in his decision and completed plan is transmitted to subordinate commanders in the form of orders. They may be issued as written field orders, they may be dictated to the subordinate commanders of principal units, issued orally, in complete form or fragmentary form. Whatever the method of issue, there are two requirements which must be met: *First*, they must reach the subordinate commanders, even of the smallest units, in time for them to make their own reconnaissance, their plans, issue their orders, and place their units in the required positions; *second*, they must be so clearly expressed as to eliminate any chance of misunderstanding or confusion.

Under many conditions of combat, especially where speed in execution is required, time may be saved by having the phases of planning and execution proceed simultaneously, each step being started as soon as it is decided upon. It may start, for example,

MILITARY MEDICAL MANUAL
THE LOGICAL BASIS OF
THE COMMANDER'S ESTIMATE OF THE SITUATION

<p style="text-align: center;">Par. 1 OBJECT</p>	<p style="text-align: center;">With the MISSION as the guiding consideration</p>
<p style="text-align: center;">Par. 2 CALCULATION</p>	<p style="text-align: center;">Estimation and Calculations of the CONSTANT FACTORS of the situation (Relative Combat Power, Time and Space, Terrain, etc.) in combination with all appropriate methods of TACTICAL ACTION leads to DEDUCTION of their EFFECT (preventing, hindering, favoring) to LIMIT the ACTION of the VARIABLE FACTORS YOUR FORCE ENEMY FORCE to all reasonable and practic- To all physical capabilities of able lines of action open to the enemy to hinder the ac- you to accomplish your mis- complishment of your mission. sion. (1, 2, etc.) (1, 2, 3, etc.)</p>
<p style="text-align: center;">Par. 3 VISUALIZATION</p>	<p style="text-align: center;">ANALYSIS of the lines of action and capabilities of the VARIABLES (WHAT WILL HAPPEN IF) OWN LINES OF ACTION OPPOSED BY ENEMY CAPABILITIES</p>  <p style="text-align: center;">etc.</p> <p style="text-align: center;">Leads to determination of the ADVANTAGES & DISADVANTAGES of your own lines of action.</p>
<p style="text-align: center;">Par. 4 SELECTION</p>	<p style="text-align: center;">COMPARISON of the advantages and disadvantages of your OWN LINES OF ACTION leads to</p>
<p style="text-align: center;">Par. 5 DECISION</p>	<p style="text-align: center;">DECISION</p>

with a warning order that the command will attack. As soon as units are designated for the holding attack, main attack, and reserve they may move to attack positions. Thus at times it is practicable to start the execution of a plan before all of its final details have been determined.

Clarity in expression is extremely important. There is no known substitute for simple, clearly expressed, concise, grammatical English. Verbosity, omission of essential details, use of "canned language" which may not be clear to the reader, with words or phrases capable of double meanings, are each to be studiously avoided.

The form and contents of orders must also be tempered by the personalities of the subordinates who are to execute them. To an aggressive, skillful, dependable leader, mission type orders may be given which leave to the subordinate great latitude in the selection of method. Such methods are appropriate within organizations which have developed mutual understanding by long association in combat. We may forget, in impersonal studies, that individuals are something far more than identical machines; they are men, all are different, and relationships must be based upon full appreciation of these human equations. General Lee achieved his greatest successes by skill in this very factor. At Chancellorsville his orders are military models for he was supported by Jackson, a corps commander who reached his greatest effectiveness when allowed latitude in deciding his actions in detail. But at Gettysburg, Lee may have suffered his greatest failure for allowing others of his subordinates to function under the same type order which worked so well with the [by then] deceased Jackson. Stuart with Lee's cavalry failed to maintain contact with the main force; this denied Lee the information on which he depended. Ewell failed to exploit a success by misinterpreting an order. Longstreet delayed the execution of two attacks either by misunderstanding, inability to dispose his forces in time, or willful disobedience. In any event, there was a lack of clear-cut orders suitable for the personalities with which he dealt, however adequate they might have been for Jackson. An order "which can be misunderstood will be misunderstood."

Supervision of Execution. The commander will fail who lacks the strength of character, the courage, the energy to supervise the execution of his orders, bending and altering them to meet new situations, directing and leading his men in the execution of the mission. It requires contact with his subordinate commanders at which time he may confer with them, explain his desires, hear their reactions, adjust conflicts, watch the execution. He must see with his own eyes the work of his men, even in advanced positions, so that he may know their problems and supply their needs. *In this process he must be seen by his men.* They must know their commander, recognize him, be convinced that he knows their situation and will take prompt action to aid them in their hazardous undertakings. It cannot be done from a command post. Nor can it be done through visits of inspectors or staff officers or by any other impersonal process. This is a task which must be executed by the commander in person. The great military leaders of history have been masters of this phase of the art of leadership. Each visit must reinforce their morale, their confidence, their willingness to accept sacrifice. Repeated time and again the day may come when the commander is given the personal respect of his men which may later develop into admiration, even to love. When that spirit is developed the force which he commands can sustain reverses and, having sustained them, can still go forward and win victories.

The size, complex nature, and speed of operation of the modern military unit make it difficult to control. The commander is likely to be unduly tempted to remain at the command post, to supervise each step in the work of his staff, to inform himself of each minor change in the situation. While his responsibility includes all of these matters, even the most trivial, he cannot permit himself to be separated from his greater responsibilities. He must surround himself with subordinate commanders and staff officers in whom he has confidence, who are able to execute this multitude of details, even important ones, in a manner which will obtain the required results. As time passes this desirable state is enhanced by training, by shift of personnel, and adjustment of methods. Finally unity of effort, coordination, mutual trust, and respect may each be developed. When that time comes the commander is free to exercise the personal control and leadership on which the success of military operations is based.

CHAPTER VIII

DEFENSE AGAINST CHEMICAL WARFARE

GENERAL CONSIDERATIONS

The Medical Officer and Chemical Warfare. The use of chemicals in warfare presents a problem of peculiar importance to members of the Medical Department. Theirs is the task of treating and evacuating gas casualties, in itself a dangerous task. They are as subject to becoming gas casualties while in the execution of their mission, except for advanced infantry units, as other arms and services. Hence, the medical officer requires a considerable knowledge of the chemicals used in war to execute his professional responsibilities, and he will need this knowledge in order to instruct the soldiers under his control for their own protection. All personnel present in an area where chemicals are employed are equally subject to its hazards.

A word of caution is in order about chemical warfare. The German introduced the use of toxic gases in World War I. Thus far, he has not chosen to do so in World War II. It is questionable that his reasons are humane. It is safer and wiser to assume that he will use it ruthlessly when he chooses to do so. The medical officer must prepare himself to be ready instantly to meet the medical situation such action would present.

The medical aspects of chemical warfare are presented in Chapter VIII, Part II, of this volume.

Chemical Warfare Defined. Chemical warfare is the tactical employment of substances which are capable, after their release in the field, of acting directly through their chemical properties to cause bodily injury or irritation, produce an obscuring smoke, or set fire to combustible material. Such substances are called chemical agents. The munitions employed to disseminate them are referred to as chemical weapons. Chemical agents, employed for their physiological effect, generally are disseminated in the form of gas which renders the atmosphere at the target dangerous to breathe and necessitates the use of gas masks or other protective equipment.

Origin of Chemical Warfare. Crude devices for generating noxious fumes to wear down the resistance of an enemy were employed in sieges by the ancient Greeks as far back as the 5th Century B.C. Such means continued to be used against walled cities until well into the Middle Ages. But as warfare became more open, these primitive devices, being no longer of general value, fell into disuse. The employment of incendiary substances in war is considered by many military historians to be as old as organized warfare. The deliberate use of screening smoke as an aid in battle is largely a recent addition to military art, although history records some instances of its employment in early times. In essence then, chemical warfare is not new. However, as an application to war of modern science and industry, it was inaugurated in the World War.

World War Development. Modern chemical warfare dates from April 22, 1915, when the Germans carried out an attack with chlorine gas against the Allies in Flanders. For this attack the Germans emplaced thousands of cylinders of liquefied chlorine in their front-line trenches. When the valves were opened the chlorine vaporized as it was released, forming a gigantic, suffocating cloud which was swept by a favorable wind for several miles before the gas was finally dissipated. Some 20,000 casualties resulted. The Allies were soon to retaliate and from then on until the close of the war gases, smokes and incendiary materials came to be used extensively. The cylinder attack gave way largely to the use of projectiles to release chemicals directly upon the target, thus making chemical operations less dependent upon wind conditions. Chlorine was soon superseded by more deadly gases, notably phosgene. In 1917 the Germans introduced dichloro-ethyl sulphide, a skin blistering substance, given the name mustard gas by British soldiers. It caused more casualties than all other types of gases used.

Hand in hand with offensive developments came the provision of gas masks and other protective means. While these were constantly improved as the war progressed, gas,

nevertheless, caused a tremendous number of casualties although comparatively few cases were fatal. More than one-fourth of the battle casualties of the American forces engaged in the war were due to gas. Among the immeasurable difficulties imposed by gas attacks were the interruption of normal activities, lowering of morale, and extra work in providing gas shelters and cleaning contaminated installations and equipment.

In pursuit of means for chemical warfare, each belligerent set up an elaborate research and development. In addition to the extensive use of artillery for chemical operations, separate tactical units of troops armed with special chemical weapons were provided.

Development Since World War. Aircraft were not used in the World War as a means of delivering gas attacks. But gas bombs and devices for use on airplanes to spray liquid chemicals have since been developed, so that gas attack from the air is now recognized as highly practicable. Another post World War development is the improvement of chemical mortars which, with motor transportation, make possible the conduct of chemical operations of considerable magnitude by ground forces in open warfare. There unquestionably has been much improvement since the World War in gas protection. However, if gas is employed in future war, the utmost precautions against surprise and a high state of gas discipline will be required.

Treaty Prohibitions of Toxic Gas. The resort to toxic gas in the World War was generally condemned by the Allies as a violation of certain provisions of The Hague Convention of 1899 on rules of warfare. Accordingly, the Peace Treaty of Versailles, and a number of subsequent treaties, contain clauses amplifying The Hague rules more to definitely prohibit toxic gas as a weapon. None of these treaties, however, has been ratified by all of the military powers. Meanwhile, all such powers have continued to maintain establishments for chemical warfare research, and provision, at least, of gas-protective equipment. General John J. Pershing, in his final report as commander in chief of the American Expeditionary Forces in the World War, sums up tersely the gas-protective problem, stating: "Whether or not gas will be used in future war is a matter of conjecture, but the effect on the unprepared is so deadly that we can never afford to neglect the question."

The United States is not a party to any treaty, now in force, that prohibits or restricts the use in warfare of toxic or nontoxic gases, or of smoke or incendiary materials.

Objects of Gas Defense Training. The objects of training in gas defense are to minimize casualties and present hostile chemical attacks from causing undue interruption to or interference with normal military activities.

Defense is predicated upon knowledge of the weapons which an enemy may employ, their capabilities and limitations, and the methods of their use. In this respect, chemical warfare is no exception. To defend against chemical attack we must not only have special equipment and understand its use, but we must know the characteristics of chemical agents and weapons and how and when they can be employed most effectively.

Responsibility of Commanders. Although the chemical casualty is the responsibility of the medical officer it is the responsibility of the infantry, artillery, armored force, in fact all *line officers* to see that the gas casualties are kept to the absolute minimum. If the troops are well equipped and well trained "gas" will be a comparatively ineffective weapon. The *individual soldier* must be taught to put his gas mask on at once and to apply the protective ointment immediately. He can not wait until he gets to the medical officer for first aid care because the damage will be irreparably done. In fact there will be no need to evacuate these trained soldiers as they will seldom become casualties. "Organization commanders are responsible for the proper training of their respective commands in defense against chemical attack and, within the means available to them, they are responsible for taking proper measures for the care and maintenance of protective equipment, and for the protection of their troops, equipment and supplies against gas."—*Basic Field Manual, Vol. 1, Chapter 8, Defense Against Chemical Attack, War Department, 1938.*

The Chemical Warfare Service. The Chemical Warfare Service of the American Army was organized in the World War as the result of experiences indicating the need for centralizing chemical warfare activities in a single agency. Following the war, in the revision of the National Defense Act, Congress made provision for this branch as a part

of the permanent military establishment. The duties of the Chief of the Chemical Warfare Service, stated in the Act, include chemical warfare research and experimentation, procurement, manufacture, or supply of chemical warfare equipment, and supervision of training in chemical warfare.

This supervised training is conducted through the Chemical Warfare School at Edgewood Arsenal, Md., chemical warfare instructors at other service schools, chemical officers on the staffs of corps area; department and division commanders; and unit gas officers of regiments and battalions of the various arms.

CHEMICAL WARFARE AGENTS AND WEAPONS, AND FORMS OF CHEMICAL ATTACK

Classification of Agents. *a. General.* Chemical agents comprise three classes of substances: gases, smokes and incendiaries.

(1) The term *gas* is here used in a broad sense as applying to a chemical agent which can be disseminated in the air to produce a powerful physiological effect.

(2) A *smoke* is a chemical agent whose principal effect is to produce an obscuring cloud.

(3) An *incendiary* is a chemical agent whose principal purpose is to cause destruction of materiel by fire.

b. Physical state. Chemical agents may be encountered in gaseous, liquid, or solid form. All chemical agents, brought to the battlefield loaded in explosive shell or other containers, are in either a liquid or solid state. Some of them vaporize at once upon their release, forming gas or smoke clouds; some tend to remain as liquids or solids but vaporize gradually; some require the application of considerable heat for their dissemination and hence are used in burning-type munitions.

c. General types of gases. Gases consist of two principal types, *toxic gases*, or those which may cause severe injury or death, and *irritant gases*, those which may have severe incapacitating effect but, in concentrations which can be produced in the field, will not cause death.

(1) Toxic gases present two distinct types, *nonpersistent* and *persistent*.

(a) A *nonpersistent* gas is one whose effectiveness is dissipated generally within 10 minutes after release. Most agents of this class are true gases which are liquefied under pressure for loading in containers. Upon release they quickly revert to their normal gaseous state.

(b) A *persistent* gas is one whose period of effectiveness extends beyond 10 minutes. Such substances are normally liquids or solids but they vaporize slowly after release.

(2) *Irritant gases* may be persistent or nonpersistent but in their case, persistency depends largely upon the method of dissemination used.

d. Physiological action. Chemical agents are classified according to their most pronounced physiological effects as:

(1) *Lung irritant*, an agent which, when breathed, causes irritation and inflammation of the lungs.

(2) *Vesicant*, an agent which blisters the skin with resultant inflammation, burns, and the destruction of tissue. It also has a corresponding effect upon the lungs and eyes.

(3) *Sternutator* (irritant smoke), an agent which acts upon the mucuous membranes of nose and throat, causing sneezing, coughing, and headache.

(4) *Lacrimator*, an agent which causes a copious flow of tears, and intense, though temporary, eye pains.

Screening smokes, as used in the field, generally have no injurious effects. Incendiary substances, in contact with the body, cause severe heat burns.

e. Tactical use. Chemical agents are further classified according to their tactical use, as:

CLASSIFICATIONS OF CHEMICAL AGENTS

GENERAL TYPE	PERSISTENCY	PHYSIOLOGICAL ACTION	TACTICAL USE	EXAMPLE (Name and Symbol)	NORMAL PHYSICAL STATE
GAS	{ Nonpersistent Persistent }	Lung Irritant	Casualty	{ Phosgene (CG) Chlorine (CL) }	Gas Gas
		{ Vesicant Lung Irritant }	Casualty	{ Mustard Gas (HS) Lewisite (M1) Ethylchlorarsine (ED) }	Liquid Liquid Liquid
	Depends on means of dissemination	Sternutator	Casualty	Chlorpicrin (PS)	Liquid
		{ Lacrimator }	Harassing	{ Adamsite (DM) Sneeze Gas (DA) }	Solid Solid
	Burning or functioning time of the munition	Negligible	Harassing	{ Chloracetophenone (CN) Tear Gas Solution (CNS) Tear Gas Solution (CNB) }	Solid Liquid Liquid
SMOKE			Screening	{ White Phosphorus (WP) HC Mixture (HC) Sulphur Trioxide Solution (FS) }	Solid Solid Liquid
INCENDIARY	Burning time	Heat Burns	Incendiary	{ Thermite (TH) Solid Oils White Phosphorus (WP) }	Solid Solid Solid

Name and Symbol	Chloracetophenone (CN)	Tear Gas Solution (CNS)
Persistency	Cloud from burning mixture drifts with wind. Will remain in low and protected places for some time. Shell or solid CN may remain several weeks.	Summer: 1 hour in open; 2 hours in woods. Winter: 6 hours in open; 1 week in woods. Dispersed as liquid which changes to gas.
Action on food and water	Gives unprotected food disagreeable odor.	Contaminates. In some cases may be removed by ventilation and heating.
Action on metals	Tarnishes steel slightly.	Tarnishes steel slightly.
How used	For harassing effect. In grenades.	For harassing effect. In artillery shell, mortar shell, airplane bombs, and airplane spray.
Protection required	Gas mask.	Gas mask.

IRRITANT SMOKES (STERNUTATORS)

Name and Symbol	Adamsite (DM)	Sneeze Gas (DA)
Odor	Not definite, slightly like coal smoke.	Grayish smoke cloud.
Color and state in field	A yellow smoke cloud.	Sneezing and burning sensation of the nose and throat. Slight lacrimation followed by occasional nausea, headache, and temporary debility. Immediately effective.
Effects on body	Immediate sneezing followed by headache, nausea, and vomiting. Temporary physical debility. Effective in low concentrations but is delayed about 5 to 10 minutes.	Same as for Adamsite.
First-aid care and emergency treatment	Remove to pure air, aspirin for headache, rest, keep warm, withhold fluids by mouth, inhale from bleach bottle. Irrigate nose and throat with 2% sodium bicarbonate solution. Clean and reapply mask after vomiting.	
Persistency	While burning, drifts with the wind, will remain in low and protected places for some time. General, 5 minutes in open.	While burning, drifts with the wind, will remain in low and protected places for some time. General, 10 minutes in open.
Action on food and water	Poisons unprotected food and water; cannot be made safe for use.	Poisons unprotected food and water; cannot be made safe for use.
Action on metals	Very slight.	Vigorous corrosion on steel.
How used	For harassing effect. In candles or generators.	For harassing effect. In candles or shell.
Protection required	Gas mask with a good filter.	Gas mask with a good filter.

SCREENING SMOKES

Name and Symbol	Sulphur Trioxide Solution (FS)	HC Mixture	White Phosphorus (WP)
Odor	Acid or acrid.	Acrid, suffocating.	Like phosphorus matches.
Color and state in field	Dispersed as liquid which changes to white smoke upon contact with air.	White smoke produced by burning munitions only.	Dispersed as solid which rapidly changes to flame and white smoke on contact with air.
Effects on body	Mild prickling sensation to skin; non-injurious.	None.	Smoke, none; particles produce severe fire burns which heal very slowly.
First-aid care and emergency treatment	Wash with copious amounts of water, then with sodium bicarbonate and treat as for ordinary burns.	None needed.	Keep part under water, use saturated wet cloth. Apply 2 to 5 percent copper sulfate solution to form a coat over the particles and prevent oxidation. Pick out solid particles and treat like ordinary burn.
Action on food and water	Liquid renders food and water unfit for use; smoke gives disagreeable odor.	Smoke gives disagreeable odor.	Smoke gives disagreeable odor; solid is poisonous.
Action on metal	Vigorous corrosion in presence of moisture.	None, if dry.	None.
How used	Screening smoke. In airplane spray for screening; in artillery shell, mortar shell, and cylinders for training to simulate cloud gas.	Screening smoke. In smoke pots or candles, for training only.	Screening smoke and incendiary. In artillery shell and mortar shell, primarily for smoke effect; also used in same munitions and airplane bombs for casualty effect and incendiary action.
Protection required	None.	None.	For smoke, none; for burning particles, none provided.

VESICANTS

Name and Symbol	Lewisite (M1)	Mustard (HS)
Odor	Like geraniums, then biting.	Like garlic or horseradish.
Color and state in field	Dark brown liquid changing slowly into a colorless gas.	Dark brown liquid, changing slowly into a colorless gas.
Effects on body	Vesicant, blisters skin. Skin shows slight irritation in 15 minutes, followed by grayish discoloration and blisters in 30 minutes to 1 hour. Systemic poisoning; vomiting. If breathed, powerful lung irritant effects within ½ hour. If unprotected, immediate irritation of eyes. Approximately six times as toxic as phosgene.	Vesicant, blisters skin. Symptoms delayed 2 to 4 hours. If exposed, eyes burn and inflame. Skin in contact with gas or liquid, discolors, followed by blisters and sores. If breathed, hoarse cough develops, followed by severe pain in chest and inflammation of lungs. Approximately four times as toxic as phosgene.
First-aid care and emergency treatment	When possible remove from contaminated area. 1. Apply protective ointment (M4) immediately. Repeat 2 or 3 times and remove. 2. Remove excess with dry cloth. Use solvent alcohol, ether, benzene, gasoline. Use soap and water. Use 8% Hydrogen peroxide 2 or 3 times, saturate cloth and leave on wound. Open blisters at once. Eyes 2 or 3 drops of (M1). Eye solution in each eye. Do not repeat. Do not use Hydrogen peroxide in eyes, rub or bandage eyes.	When possible remove from area and remove contaminated clothing, otherwise, leave clothing on. Small area of clothing contaminated, cut it away and cover the skin with protective ointment. 1. Apply protective ointment immediately. Repeat 2 or 3 times and remove. 2. Remove excess HS with dry cloth. Use solvent, alcohol, ether, gasoline. Wash soap and water. Apply Dichloramine "T" in Triacetin Inhale from wide mouthed bleach bottle. Eyes irrigate with water, bland oil (castor oil), 2% butyn or pontocaine compound ointment. Do not use M1 Eye Solution, bandage eyes, or rub eyes. Do not use cocaine in eyes.
Persistence	Dispersed as liquid which slowly changes to gas. Rate of vaporization depends on temperature, vegetation, and method of dispersion. Rapidly destroyed by water. Summer: 24 hours in open; 2 or 3 days in woods. Winter: 1 week or more.	Dispersed as liquid which slowly changes to gas. Rate of vaporization depends on temperature, vegetation, and method of dispersion. Summer: 4 to 5 days in open; 1 week in woods. Winter: Several weeks.
Action on food and water	Food which has come in contact with these gases, whether vapor or liquid, should not be eaten because of the great danger of arsenical poisoning. The salvaging of foods exposed to this gas depends on the degree of contamination and the suitability of such food for consumption should be passed on only by qualified experts after a thorough chemical examination.	All foods contaminated with the liquid form must be viewed with suspicion. Fatty foods (milk, cream, butter, cheese, fatty meats, eggs, etc.) contaminated either by vapor or by liquid will almost certainly be highly dangerous and should be destroyed. Slight contamination with mustard gas vapor may affect palatability but, except for fatty foods, the materials should be edible after 48 hours' airing and cooking.
Action on metal	Very slight.	Very slight.
How used	For casualty effect or to deny ground through threat of casualties. In artillery shell, mortar shell, airplane bombs, airplane spray, and land mines.	For casualty effect or to deny ground through threat of casualties. In artillery shell, mortar shell, airplane bombs, airplane spray, and land mines.
Protection required	Gas mask and protective clothing.	Gas mask and protective clothing.

LACRIMATORS

Name and Symbol	Chloracetophenone (CN)	Tear Gas Solution (CNS)
Odor	Like apple blossoms.	Like fly paper.
Color and state in field	Bluish gray smoke from burning type munition; colorless from shell.	A colorless liquid, changing to colorless gas.
Effects on body	Piercing irritation of eyes causing profuse tears. Effective in extremely low concentrations.	Piercing irritation of the eyes, profuse tears, followed by nausea and vomiting.
First-aid care and emergency treatment	Wash eyes and skin with water. Use 2% sodium bicarbonate solution. 2% butyn for eye pain. Calomine lotion on skin. Protect eyes from light. Do not rub, bandage or use cocaine in eyes.	Same as Chloracetophenone.

Name and Symbol	Chloracetophenone (CN)	Tear Gas Solution (CNS)
Persistency	Cloud from burning mixture drifts with wind. Will remain in low and protected places for some time. Shell or solid CN may remain several weeks.	Summer: 1 hour in open; 2 hours in woods. Winter: 6 hours in open; 1 week in woods. Dispersed as liquid which changes to gas.
Action on food and water	Gives unprotected food disagreeable odor.	Contaminates. In some cases may be removed by ventilation and heating.
Action on metals	Tarnishes steel slightly.	Tarnishes steel slightly.
How used	For harassing effect. In grenades.	For harassing effect. In artillery shell, mortar shell, airplane bombs, and airplane spray.
Protection required	Gas mask.	Gas mask.

IRRITANT SMOKES (STERNUTATORS)

Name and Symbol	Adamsite (DM)	Sneeze Gas (DA)
Odor	Not definite, slightly like coal smoke.	Grayish smoke cloud.
Color and state in field	A yellow smoke cloud.	Sneezing and burning sensation of the nose and throat. Slight lacrimation followed by occasional nausea, headache, and temporary debility. Immediately effective.
Effects on body	Immediate sneezing followed by headache, nausea, and vomiting. Temporary physical debility. Effective in low concentrations but is delayed about 5 to 10 minutes.	Same as for Adamsite.
First-aid care and emergency treatment	Remove to pure air, aspirin for headache, rest, keep warm, withhold fluids by mouth, inhale from bleach bottle. Irrigate nose and throat with 2% sodium bicarbonate solution. Clean and reapply mask after vomiting.	
Persistency	While burning, drifts with the wind, will remain in low and protected places for some time. General, 5 minutes in open.	While burning, drifts with the wind, will remain in low and protected places for some time. General, 10 minutes in open.
Action on food and water	Poisons unprotected food and water; cannot be made safe for use.	Poisons unprotected food and water; cannot be made safe for use.
Action on metals	Very slight.	Vigorous corrosion on steel.
How used	For harassing effect. In candles or generators.	For harassing effect. In candles or shell.
Protection required	Gas mask with a good filter.	Gas mask with a good filter.

SCREENING SMOKES

Name and Symbol	Sulphur Trioxide Solution (FS)	HC Mixture	White Phosphorus (WP)
Odor	Acid or acrid.	Acrid, suffocating.	Like phosphorus matches.
Color and state in field	Dispersed as liquid which changes to white smoke upon contact with air.	White smoke produced by burning munitions only.	Dispersed as solid which rapidly changes to flame and white smoke on contact with air.
Effects on body	Mild prickling sensation to skin; non-injurious.	None.	Smoke, none; particles produce severe fire burns which heal very slowly.
First-aid care and emergency treatment	Wash with copious amounts of water, then with sodium bicarbonate and treat as for ordinary burns.	None needed.	Keep part under water, use saturated wet cloth. Apply 2 to 5 percent copper sulfate solution to form a coat over the particles and prevent oxidation. Pick out solid particles and treat like ordinary burn.
Action on food and water	Liquid renders food and water unfit for use; smoke gives disagreeable odor.	Smoke gives disagreeable odor.	Smoke gives disagreeable odor; solid is poisonous.
Action on metal	Vigorous corrosion in presence of moisture.	None, if dry.	None.
How used	Screening smoke. In airplane spray for screening; in artillery shell, mortar shell, and cylinders for training to simulate cloud gas.	Screening smoke. In smoke pots or candles, for training only.	Screening smoke and incendiary. In artillery shell and mortar shell, primarily for smoke effect; also used in same munitions and airplane bombs for casualty effect and incendiary action.
Protection required	None.	None.	For smoke, none; for burning particles, none provided.

SYSTEMIC POISONS

Name and Symbol	Hydracyonic Acid (HCN)	Arsine (AsH ₃)
Odor	Bitter almonds.	Garlic-like odor.
Color and state in field	Colorless and volatile liquid, forming a colorless gas when released from container.	Colorless, inflammable gas.
Effects on body	Giddiness, headache, convulsions, unconsciousness, and death.	Shivering, weakness, giddiness, nausea, vomiting, headache, arremia, anuria, uremia.
First-aid care and emergency treatment	Inhale amyl nitrate, artificial respiration, sodium nitrate, sodium thiosulfate, or methylene blue intravenously.	Absolute rest, evacuate in prone position, force fluids, carbohydrates, blood transfusion, promote diuresis.
Action on food and water	Liquid renders food and water unfit for use.	Arsenic makes food and water unfit for use. With large stores, degree of contamination to be determined by analysis.
Action on metal	Slight.	None.
How used	Casualty producing agent when used in a confined space.	Casualty producing agent when used in a confined space.
Protection	Gas mask if worn at time gas is laid down.	Gas mask if worn at the time gas is laid down.

g. Symbols. Brief lettered symbols are commonly used to designate chemical agents, particularly in identification markings on chemical munitions; *e.g.*, C G is the symbol for phosgene.

Concentration and Time of Exposure. The degree of injury produced by a gas depends, not only upon its inherent properties, but upon the *amount* by weight of the substance present in the air, (referred to as the concentration), and the length of the period of exposure. The action of most gases is cumulative; the longer the exposure, the more severe the injury. In general, exposure to a low concentration for a long period will produce the same results as brief exposures to a high concentration.

Characteristics. During and since the World War, many thousands of chemical compounds have been studied for their military possibilities. Of these but a dozen or so are considered of great value. New and more potent agents will undoubtedly be discovered in the future. However, it is believed that the characteristics of any new agent will, in the main, conform to those of some one of the known types. Hence, the practical information about representative agents, contained in the accompanying table, should be of considerable value in meeting any gas-protective problems that may arise.

Objects of Chemical Attack. Chemical attacks are made with one or more of the following objects in view:

- a.* To inflict casualties.
- b.* To deny ground by contaminating it with persistent gas.
- c.* To contaminate material and supplies.
- d.* To harass by forcing the use of gas masks.
- e.* To lower the morale of troops.
- f.* To interfere with observation by smoke.
- g.* To destroy material and supplies by burning.

Tactical Principles in Use of Gas. *a. Nonpersistent gas.* Surprise is essential for appreciable casualty effect, hence, when this gas is used in projectiles fire is sudden, rapid and intense, but usually of short duration. Successive bombardments, at varying intervals, of time, are suitable. Massed troops in stationary position, particularly troops asleep, are the most profitable targets.

b. Persistent gas. In an offensive this type of gas is used only on areas which the attacking troops will avoid in their advance. It may be used extensively by a defender. Fire to deny ground may be slow, but fire against personnel for casualty effect should be executed rapidly.

c. Irritant gas. Harassing agents are useful, particularly against troops at work on their position or engaged in bringing up supplies. These agents are effective in very low concentrations and therefore are economical in ammunition expenditure.

d. Smoke. Smoke is used to blind hostile observation and for deception. In attack, smoke is placed directly upon the defender's forward positions to prevent aimed fire upon

advancing troops. It is also used against rearward observation points. In defense, the use of smoke is limited so as not to obscure the defender's own field of fire.

e. Incendiaries. These agents are used primarily for destruction of material.

Weather and Terrain Influences. *a. Weather.* Gas and smoke clouds travel with the wind, spreading and thinning out as they travel from their source. The rate of width increase is about 15% of the distance traveled. Winds of more than 12 miles per hour velocity tear chemical clouds apart and disperse them rapidly.

Sunshine, especially in warm weather, is conducive to rising air currents (convection) which rapidly dissipate chemical clouds by causing them to rise. In the case of persistent agents, warm weather accelerates their evaporation. Rain may destroy or partially destroy gas or smoke by beating it out of the air, draining it away, or by chemical action (hydrolysis).

Cool, cloudy weather with wind steady at low velocity, is favorable for the use of non-persistent gas. On the other hand, warm weather is generally more suitable for persistent gas because a higher concentration is then developed than when the weather is cool. Mustard gas solidifies in freezing weather, remaining inert until the temperature rises sufficiently to melt it. Lewisite is effective in cold weather but is destroyed by moisture.

b. Terrain. War gases, being heavier than air, tend to hug the ground, flow downhill and collect in depressions, remaining effective in such places for a considerable time after the open, high areas are clear of gas. In woods, rising air currents are generally absent or less pronounced, and wind velocity is retarded. Hence, low-lying woods are the best target area for gas. Ground covered with dense undergrowth is especially suitable for use of vesicant agents, since men, moving through such areas, will brush off the chemical on their clothing.

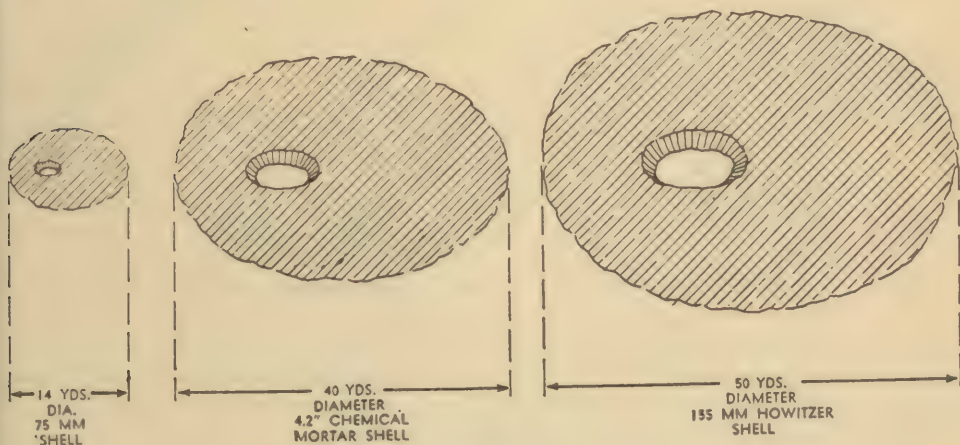


Plate 1. Chemical Shell Bursts.

Chemical Mortar and Artillery Shell Attacks. *a.* The chemical mortar is a light, mobile cannon, designed for rapid high-angle fire of large capacity shell. Within its maximum range, generally less than 3000 yards, mortars may be used to put down and maintain high concentrations of persistent or nonpersistent gas, fire smoke, or incendiary agents. Both light and medium field artillery pieces may be similarly used, though the light gun is not suitable for fire of nonpersistent gas shell.

b. Danger areas. A chemical shell contains sufficient explosive to break it open upon impact and disperse the chemical (see illustrations). The danger area is not only that over which the chemical is thrown upon explosion, but extends for some distance downwind therefrom. In the case of nonpersistent gas, this danger distance varies from 200 to 300 yards for a single shell, to several miles for a heavy concentration over a wide front.

In the case of explosion of persistent gas shell, a part of the chemical changes immediately

to gas; part of it is so finely atomized that it, too, travels with the wind, while the remainder, in liquid form, is distributed over the ground and slowly changes to gas. Thus, downwind from the point of burst, there continues to be a danger area until vaporization of the chemical is complete. The depth of this area varies from about 200 yards, for a single shell, to 1000 yards, or possibly more, in the case of a heavy concentration on a wide front.

A chemical shell containing a liquid can ordinarily be distinguished from other shells by the peculiar intermittent, whirring noise it makes in flight and by its low detonation.

Chemical Projector Shell Attacks. The projector is a simple mortar of large bore, which fires one shot per installation. It has a comparatively short range, the maximum being usually about 1500 yards. For employment, projectors, generally in large numbers, are emplaced close together in the user's front line, and discharged simultaneously by an electric current. By this means gas in very high concentration can be released suddenly upon a target.

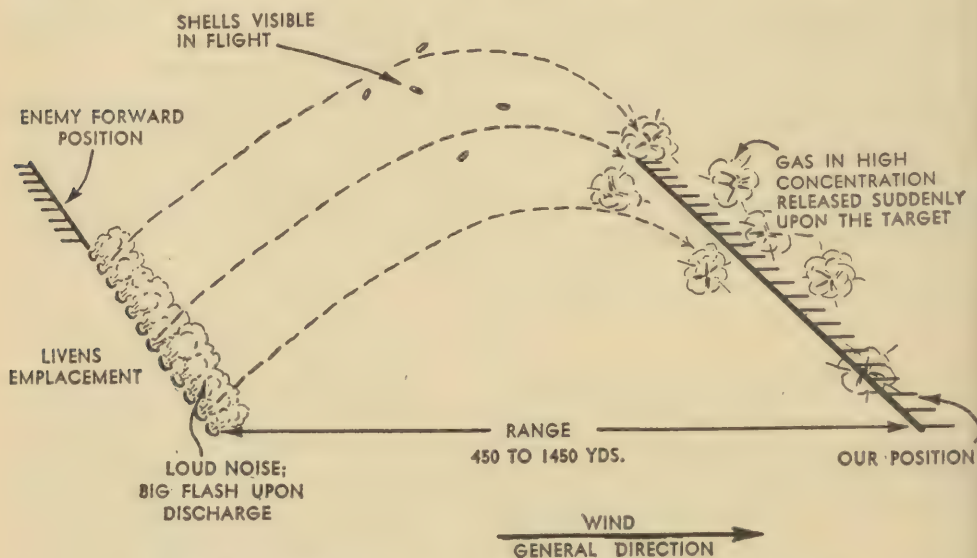


Plate 2. Livens Projector Attack—Diagrammatic Illustration.

Projector attacks are likely to be followed shortly by infantry attack. An enemy may fire two salvos, first one of high explosive, for tremendous blasting effect on targets above ground, and then one of nonpersistent gas to reach targets in trenches and dug-outs. An enemy on the defensive may use persistent gas with projectors.

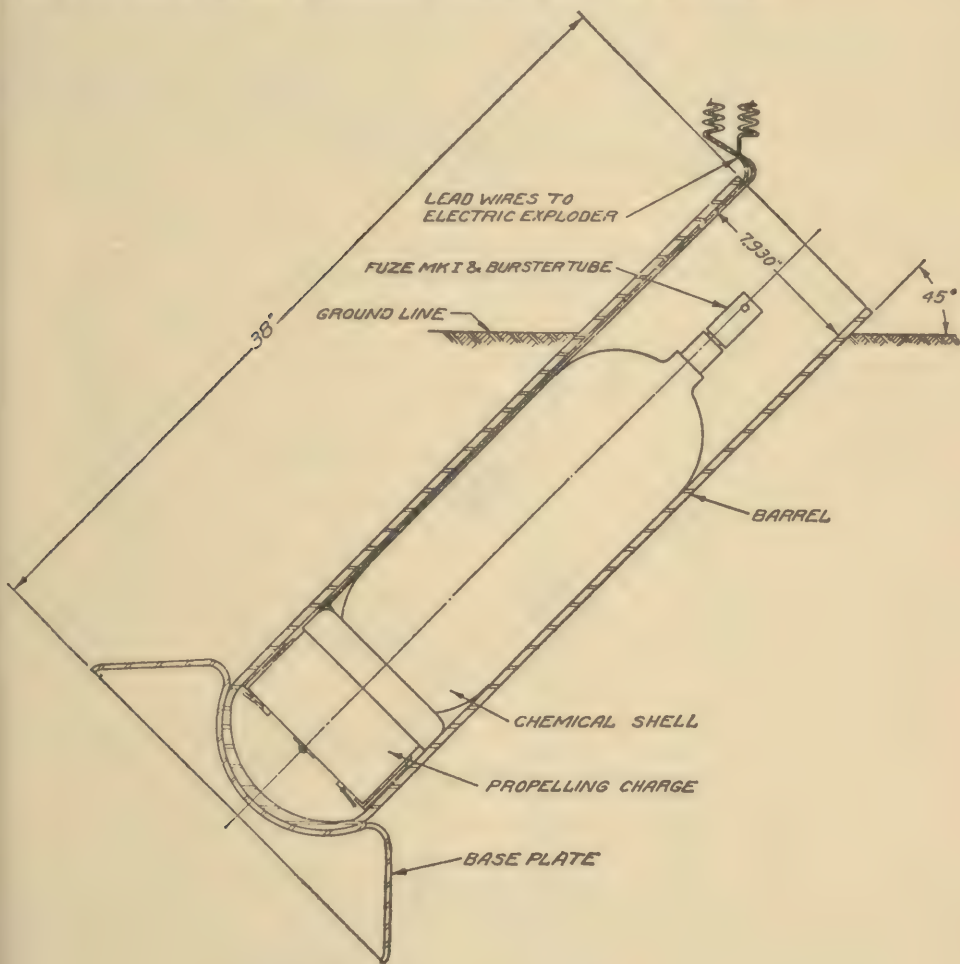
Projectors are generally emplaced at night, for fire that night or early the following morning. Their installation may sometimes be discovered by aerial observation. The metallic sounds usually made in emplacing them, possibly may be heard in our lines. In large scale gas operations, the danger area extends several thousand yards downwind of the impact zone.

When fired, the brilliant flash of discharge may be seen, or the loud noise of same heard, in time to enable troops in the target area to adjust gas masks before the shells fall.

Chemical Attacks from Aircraft. Either bombs, or apparatus for spraying persistent gas or smoke, may be used in chemical attacks from aircraft. Small bombs containing persistent gas, or white phosphorus, may be dropped from high or low altitudes. Large bombs weighing 100 pounds or more, containing nonpersistent or persistent gas, may be employed by bombardment aviation. Persistent gas may be used in conjunction with demolition bombs to hamper, or prevent the repair work. Incendiary bombs, both large and small, are also applicable.

Persistent agents, such as mustard gas or Lewisite, may be sprayed from airplanes in

attacks upon ground troops or used to contaminate ground or supplies. The persistency of such agents when sprayed from airplanes is considerably less than when fired from shell, owing to the small size of the drops and consequent increased surface area of the liquid exposed to the air. Attack aircraft flying at 50 to 1000 feet can lay a belt of persistent gas approximately one mile long, the width of the belt depending upon the altitude of the plane and the wind velocity and direction. A plane flying at 100 feet elevation, with a cross wind of 10 miles per hour, can gas an area one mile long by 100 yards wide. Troops in column present a particularly favorable target for such attack.



FULL SURFACE SET UP

Plate 3. Livens Projector MK1.

At the beginning of World War No. II the French and British proved the feasibility of high altitude airplane spray of a vesicant agent, particularly mustard. They proved that mustard could be sprayed from altitudes of at least fifteen thousand feet. The vesicant mist so formed would not reach ground for some fifteen or twenty minutes after the passage of the plane and therefore this type of attack would be very insidious since fine droplets of the vesicant agent would probably be in the eyes by the time the odor was detected. Since the capitulation of the French it is possible that they passed on this information to the Germans and that they are conducting experimentation along this line.

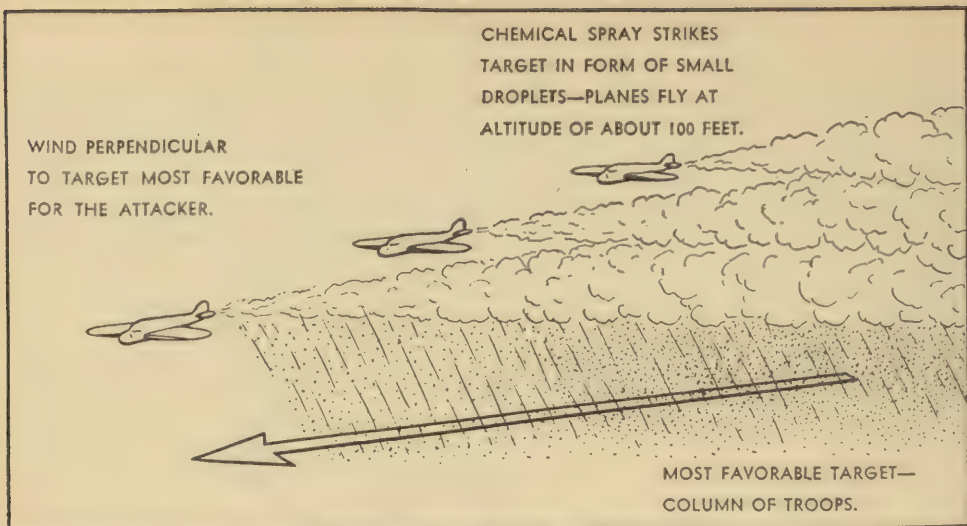


Plate 4. Airplane Chemical Spray Attack.

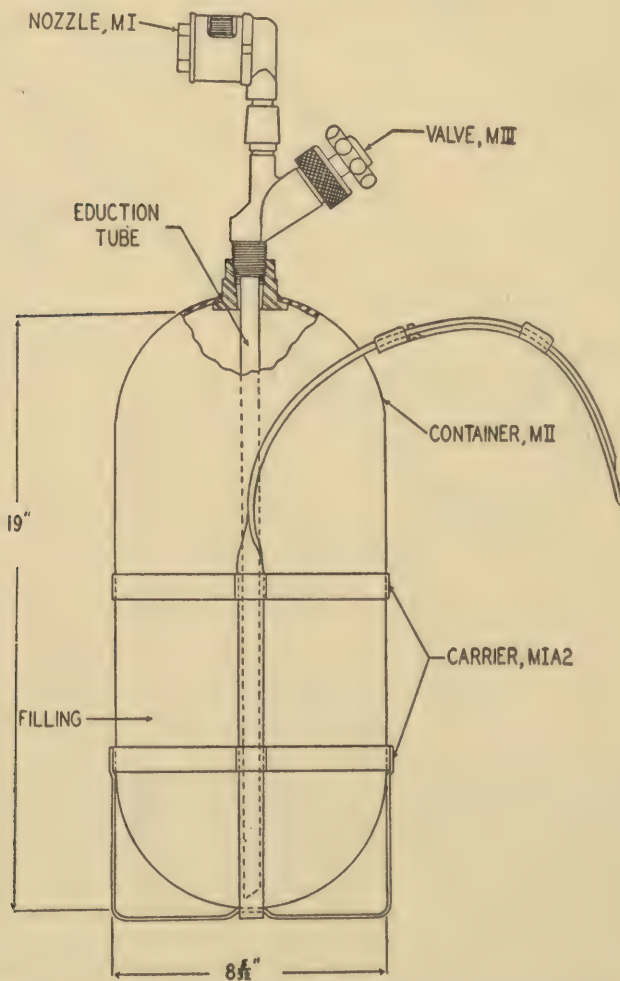


Plate 5. Portable Cylinder with Nozzle and Firing Device,

Until chemical is sprayed or bombs burst, there is no way for troops on the ground to determine whether chemicals, other means, or both will be used. Consequently, upon warning of the approach of hostile aircraft, particularly low-flying airplanes, gas masks should be adjusted.

Cloud Attacks With Cylinders or Candles. Cylinders filled with nonpersistent gas which vaporizes upon release by opening valves, or candles for generating clouds of irritant smokes by a burning process, may be employed by an enemy when the wind conditions are such as to carry the chemical cloud from his position to that of the target. Such weapons are applicable, primarily, to stabilized situations. Cloud attacks usually are conducted on a large scale to effect an area extending for several miles downwind from the place of release of the chemical. These attacks are generally made at night, or during the early morning, with a view to surprise effect. The gas cloud is normally white from condensed water vapor, but the actual position and width of the front of attack is likely to be disguised by smoke. At the moment of discharge of gas cylinders the hissing noise made as the gas escapes may be heard in time to give warning.



Plate 6. Gas Cloud Attack with Cylinders—Diagrammatic Illustration.

Use of Chemical Land Mines and Bulk Chemicals. An enemy organizing a position for defense or engaged in a retrograde movement, may make use of mines filled with persistent chemicals to contaminate roads, or other important areas, to deny their use. For such purposes, persistent gas may also be liberated from containers carried on tanks or other vehicles. Gas, thus employed by these means, is highly persistent. It can be detected by odor and visible splashes.

Use of Chemical Grenades. Hand grenades filled with irritant gas, or white phosphorus, may be used in local operations, particularly to force personnel to evacuate dug-outs or other inclosed spaces. Hand grenades can be thrown about 35 yards.

PROTECTIVE EQUIPMENT AND PROCEDURE

Classification of Protective Measures. Protection against chemical attack involves both technical and tactical measures. *a. Technical protection* is passive in character. It consists of (1) *individual protection*, or the equipment and measures applicable to the individual, and (2) *collective protection*, or the unit equipment and measures applying to a group.

b. Tactical protection has to do with active measures of security against hostile chemical operations.

The Army Gas Mask. *a. Description.* The principal item of individual protection is the Army gas mask. This mask consists of a facepiece, hose tube, canister, and canvas bag carrier. A mask is carried at all times in the field by each soldier. It is adjusted upon sounding of a gas alarm, or whenever the individual detects the presence of gas. When the mask is worn, all inspired air is drawn through the canister, where war gas or smoke is removed. Exhaled air passes out through a valve connected to the facepiece. Protection depends upon a properly fitting mask, free of leaks, and a serviceable canister.

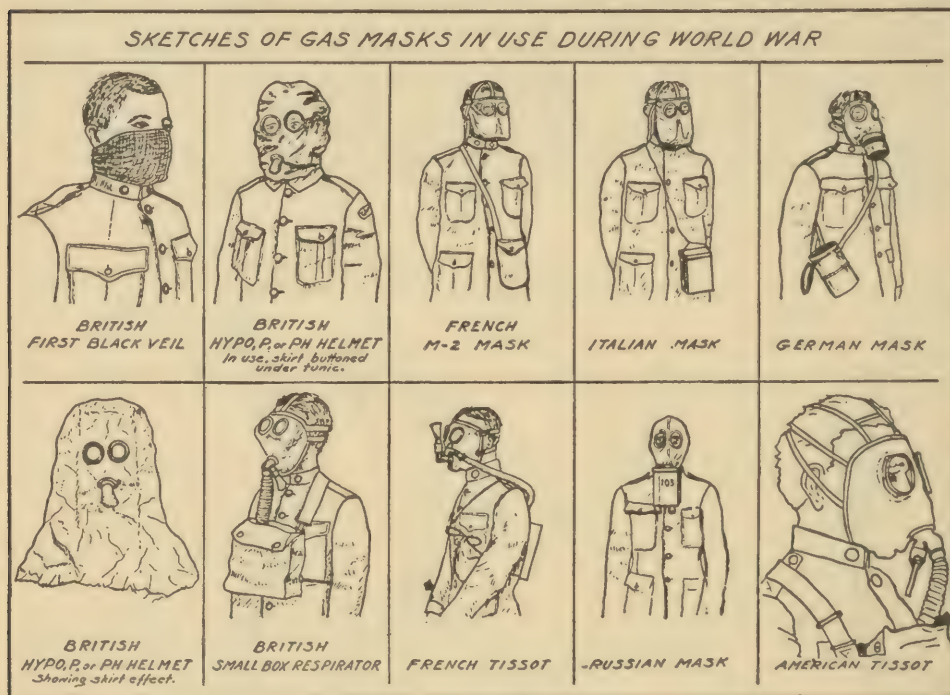


Plate 7. World War Gas Masks.

b. Limitations. The Army gas mask is designed for protection against war gases only. It is unsuitable for use in fighting fires, fumigation work, or any activity in which toxic gases, such as carbon monoxide or ammonia gas, may be encountered. For such cases, special canisters should be used. Another important limitation is, that being solely an air filter, the Army mask does not protect against atmospheres deficient in oxygen.

c. Service life. After considerable use, the filter components of the canister may deteriorate, or become saturated. However, before a canister becomes dangerous, it gives warning of its deterioration by admitting a minute quantity of gas which can be smelled. Periodic inspection of masks issued to troops should be made by officers.

d. Training. A gas mask impairs the efficiency of the wearer by resistance to breathing and limitation of vision. The handicap is, in part, psychological. It can largely be overcome by training, gradually increasing the periods of wear.

Fitting of gas masks, gas mask drill, and use of the gas chamber pertain to field training and hence are not dealt with here.

Protective Clothing. Protective clothing, which is designed for the protection of the body against gases of the mustard type, will be issued in time of war. It may be impervious or impregnated clothing.

Protective Ointment. A tube of protective ointment is issued to each soldier. This package will not only contain the ointment but material for applying and wiping it off and, in addition, an ampoule of M-1 eye solution for use against lewisite con-

tamination of the eyes. *Each individual* must be taught that he is responsible for his own decontamination in case of contamination by any of the vesicant agents. The protective ointment if promptly and efficiently applied to contaminated areas will prevent the individual contaminated with the vesicants from becoming a casualty. Particularly in the case of lewisite contamination, the protective ointment should *not* be used after the skin becomes erythematous.

Identification of Gases. No practicable apparatus for identification of gas in the field has been devised. Soldiers must depend on their sense of smell to detect and identify gases by their distinctive odors.

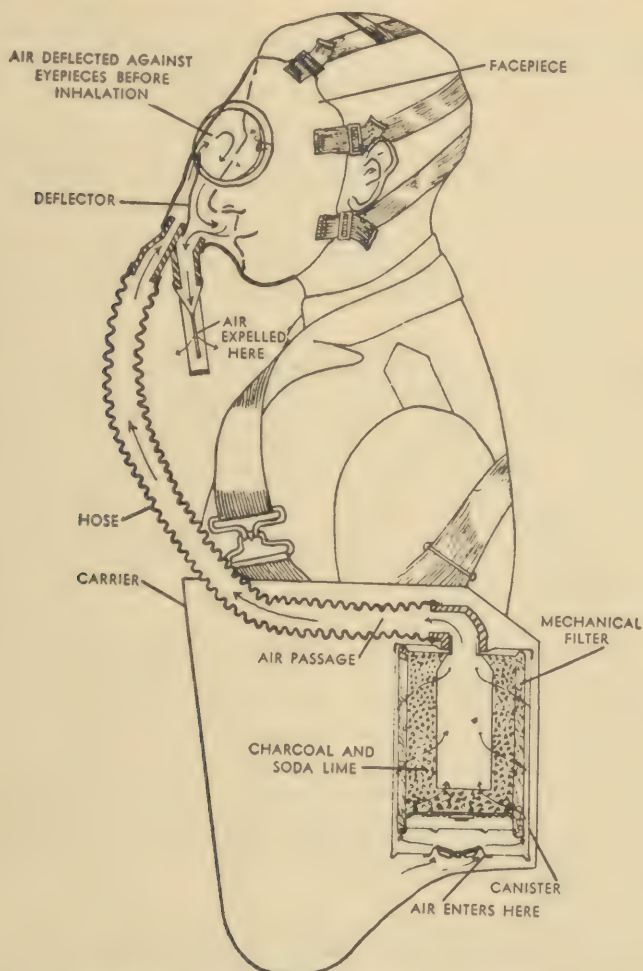


Plate 8. United States Service Gas Mask.

First Aid. Every soldier should be thoroughly familiar with the first aid treatment of injuries from chemicals as set forth in the table, Characteristics of Agents. In rendering first aid treatment to gas casualties, a gas mask and protective gloves should be worn.

Gas Discipline. The prompt and orderly adoption of proper protective measures by a command, when it is subjected to a gas attack, is evidence of good gas discipline. Such discipline comes through knowledge and training. With respect to the individual soldier gas discipline means that he has no unreasonable fear of gas; has confidence in his protective equipment; upon detecting gas, he at once shouts "GAS," and then holds his breath until his mask is adjusted.

Gas-Proof Shelters. A gas-proof shelter is an inclosed space rendered gas-tight. It should have a double doorway in the form of an *air-lock* to prevent gas from penetrating the enclosure as men enter or leave it. In areas subjected to gassing for long periods, gas shelters are needed as places where men may eat, sleep, and rest. They are desirable especially for command posts, telephone exchanges, and aid stations. Non-ventilated shelters are usually suitable for use for several hours, if necessary.

Collective Protector. A collective protector is a device for ventilation of a gas shelter. It consists of a motor-driven, or hand-operated blower, and a large canister to purify the air drawn into the enclosure.

Gas Alarms. Where a large force is involved a gas alarm system, applicable to a wide area, should be provided. Steam whistles or siren horns, if available, may be employed. Frequently, means of rapid communication will have to be depended upon. As local alarms, Klaxon horns, and other similar devices which make a distinctive sound may be used.

Degassing and Decontamination. Following gas attacks, it frequently will be necessary to carry out rather elaborate measures to get rid of the gas. Even gasses of the nonpersistent type tend to collect and tend to persist in trenches and dug-outs. The problem here is one of ventilation. Fanning, and the building of fires to create drafts, should be resorted to. Clothing and equipment which smell of the gas should be exposed to wind and sun; metal equipment, especially if damp, should be cleaned and re-oiled to prevent corrosion; and food and other supplies which have been exposed should be examined for evidences of damage or poisoning.

In the case of an attack with a persistent agent, such as mustard gas, neutralizing chemicals must be employed. The cleaning processes involved are referred to as decontamination. Men engaged in this work must wear gas masks and protective clothing.

Decontamination materials usually available are water, earth, soap, kerosene or gasoline, and chloride of lime. A supply of the latter is part of the field equipment of combat units.

Water, unless hot, has little effect on mustard gas, except that, when applied with pressure, it may drain off some of the chemical. Water destroys Lewisite as such, but a toxic solid residue is left. This gives off no vapor, but is dangerous to touch. Wherever possible, sodium hydroxide should be used to neutralize Lewisite.

Kerosene and gasoline do not destroy vesicant agents, but dissolve them, hence they are useful in cleaning contaminated articles.

Chloride of lime destroys mustard gas. However, when used for this purpose, it should be mixed with water, or earth, to prevent a violent heat reaction and consequent driving off of gas in high concentration. Chloride of lime is corrosive to metal and should not be used to decontaminate working parts of guns or machinery.

a. Ground. It is impracticable to decontaminate a large area of ground with chemicals. Sometimes an area may be decontaminated by burning it off. During the burning friendly personnel should keep away from the downwind side of the area. Small areas, such as a few mustard gas shell holes, especially near an important installation, can and should be decontaminated by covering them with a 3-inch layer of one part dry chloride of lime to about three parts of earth.

b. Concrete. Contaminated concrete installations should be covered with a paste made of chloride of lime and water. This should be left on for at least 24 hours, then washed off, and the surface covered with sodium silicate (water glass) to seal in any of the agent which may remain.

c. Wood. It is practically impossible to decontaminate wood permeated with persistent gas. Wood buildings and objects so contaminated, which constitute a source of danger, should be burned.

d. Metal. Metal equipment, including guns and ammunition, in so far as practicable, should be protected by paulins, or placed in gas shelters. If contaminated, such equipment should be swabbed with kerosene or gasoline, then with chloride of lime if practicable. They finally should be washed with hot water and soap, and re-oiled.

Vesicant agents are readily absorbed by ordinary paint, hence are difficult to remove from painted articles, unless they are treated at once.

e. Vehicles. Vehicles splashed with gas may be partially decontaminated by hosing them down with water, preferably hot, but as soon as possible treatment with neutralizing chemicals should be undertaken.

f. Clothing. Persistent gas can be removed from clothing and fabric by steaming the articles for about six hours. This process may be reduced to two hours, if the articles are first exposed, for one hour, to chlorine.

g. Leather. Harness and other leather equipment, which has been sprayed or splashed with liquid vesicants must be treated at once. If permeated by chemicals, such equipment should be burned or buried.

Protection of Food and Water. Whenever practicable food, forage, and water supplies should be kept in a gas tight containers until used. The possibility of contamination of food stuffs by chemical agents makes it highly important for the medical officer to remember that:

Chemical agents are highly penetrative.

Food stuffs are often highly absorbent particularly foods of high water and fat content.

Packaging materials may be absorbent and may permit the passage of the chemical agent.

Where air can penetrate so can "gas" (gas mask excepted).

Any material which will soak up oil or water will absorb and eventually permit the passage of chemical agents.

Ventilation may be helpful but also provides a means for the entrance of "gas".

It is not necessary to discard all food stuffs contaminated by chemical agents. Whether or not the food can be salvaged and rendered fit for human consumption is dependent upon the type of chemical agent, the degree of exposure, the kind of food, the manner in which it is packaged, and the way it has been protected.

All chemical warfare agents contaminate food either by going into solution in the water or fat present in the food or by being absorbed on the solid surface. In either case chemical reactions may occur which will result in some decomposition of either or both the chemical agent and the food. If hydrolysis takes place the chemical agent loses its original properties and, generally speaking, becomes innocuous.

Warning. *No such beneficial action will occur with those agents containing arsenic especially lewisite, ethyldichlorarsine, or arsine.* Even though the original properties of the chemical agent are destroyed the hydrolysis products remain toxic due to the presence of arsenic. Many of the decomposition products which result from hydrolysis may be somewhat unpleasant tasting but not toxic, and the only action would be to render the food unpalatable. A comparable action does not occur in foods of high fat content when contaminated by the vesicant or arsenical agents, and such food must be considered unfit for human use.

The water in shell holes or small ponds should in no case be used. Any supply of water contaminated with arsenical agents must not be used because the hydrolysis products are sufficiently soluble to be dangerous in a water supply. These soluble arsenious oxides can not be removed by ordinary water purification processes.

Mustard gas is soluble in water to the extent of 800 p.p.m. at 20° C. When water is contaminated by mustard it is distributed into a surface film, a water soluble fraction, and any in excess of this settles to the bottom. The undissolved mustard may remain unchanged for several weeks in the bottom of the water. Water containing 500 p.p.m. or more of mustard gas can not be treated so as to be safe for human consumption. With less than 500 p.p.m. the water may be treated that the following procedures are employed: Treatment with unusually large doses of activated carbon followed by coagulation and settling. The settled water must then be filtered and chlorinated beyond the break point.

Caution. If the filtered water has a five minute chlorine demand or more than 5 p.p.m., water is still unsafe for use.

Bathing and Re-Clothing Units. In the World War mobile units, consisting of trucks provided with shower bath equipment and supplies of fresh clothing, were employed for

the protection of troops exposed to mustard gas. These measures will be required when similar chemicals are used in the future.

Protection of Animals. Horses and mules are much less susceptible to gas, generally speaking, than man. These animals, however, are highly susceptible to injury by gases of the mustard type. Animals working in gassed areas should be protected by gas masks, and also by gas-proof boots, if the area contains a vesicant substance. They should be washed at once after exposure to a vesicant agent.

Pigeons should be protected during gas attacks by gas-proof loft covers, or should be released.

Gas Protective Organization. Organization commanders have on their staffs specialists in gas protection who supervise the execution of protective measures under the authority of the commander.

In the division, corps and army, these specialists are officers of the Chemical Warfare Service, referred to as chemical officers. They handle the supply of gas protective equipment, conduct schools in gas defense, make inspections, carry on chemical warfare intelligence and reconnaissance activities, and advise the commander on all matters pertaining to chemical warfare.

Each unit below the division, down to the battalion, details an officer as the *unit gas officer*. He is directly concerned with gas defensive training of troops, inspection and maintenance of protective equipment, gas reconnaissance in battle, and supervision of degassing and decontamination work.

Each company, troop, or battery, details a *gas noncommissioned officer* to assist the company commander in his gas protective duties.

Gas Sentries. Each combat unit provides its own gas sentries. Their principal duty is to detect the presence of gas in their areas, give the alarm when gas is so detected, and awaken sleeping men in their areas in time for these men to adjust their gas masks before being dangerously exposed. The number of gas sentries to be provided depends upon the number of men to be protected, and the size of the area over which the men are distributed. Gas sentries should be intelligent, alert and active, and possess keen senses of smell and hearing. They should sound their alarms only when they actually detect gas in their areas. To sound an alarm merely because an alarm in another area is heard, might result in needless disturbance of sleeping troops.

Standing Orders. Standing orders for defense against chemical attack are general orders issued by each army, corps, division, or smaller force, if acting independently, which prescribe definite and uniform training and procedure in the protection of the command against gas. They are issued upon mobilization, and are modified from time to time as necessary.

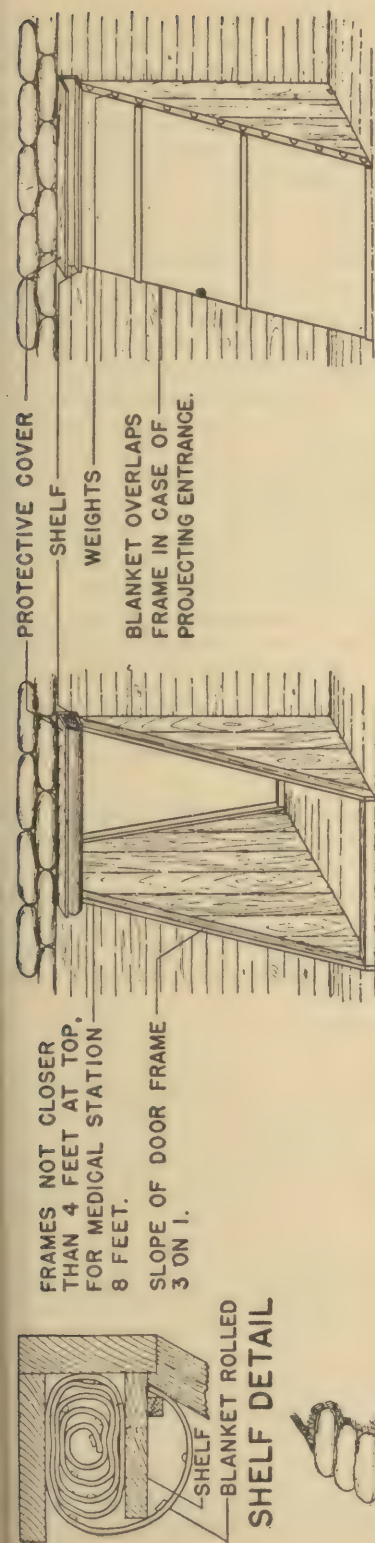
Tactical Protection. Tactical protection includes such activities as chemical warfare reconnaissance and intelligence, consideration of the influence of chemical warfare on selection of routes of march and battle positions, maneuver to avoid gassed areas, and offensive action to limit or disrupt hostile chemical attacks.

Chemical Intelligence. Military intelligence, pertaining to chemical warfare, is derived and disseminated generally by the same agencies providing other intelligence. However, by reason of its technical nature, officers, having special training in chemical warfare, usually are depended upon to secure it.

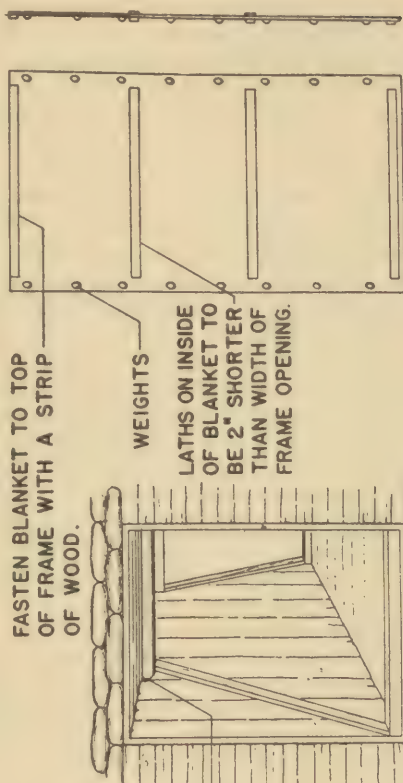
War Department chemical intelligence pertains to the enemy's chemical warfare policy, training, and capability.

Chemical combat intelligence deals with information of the chemical warfare activities, preparations, and intentions of the enemy forces in the field.

Gas Indications. It may be expected that an enemy will seek to vary his use of gas so as to conceal his intentions. It is unsafe, therefore, to depend on gas indications alone in estimating the enemy's future action. However, in the main, chemical operations will conform to well established tactical principles. An attack with nonpersistent gas is likely to be followed shortly by an attack by infantry or by a repetition of the gassing. Such attacks may be masked by smoke. On the other hand, the gassing of an area with persistent gas is a good indication that the enemy does not intend to send foot troops through that area.



PROJECTING ENTRANCE



BLANKET DETAIL

HORIZONTAL GALLERY

Plate 9. Gas-Proofing Dugouts.

ARRANGEMENT OF GAS BLANKETS

Chemical Reconnaissance. *a. Chemical reconnaissance on the march.* (1) Distant reconnaissance. Aviation, motorized, or mounted elements are looked to for early information bearing directly, or indirectly, upon protection against gas. Maps and air photographs will show critical areas, such as defiles, which favor the use of chemicals by the enemy; alternate routes, which may be used to avoid such areas; and suitable localities for halts. For gas protection, a bivouac area should be on high ground devoid of dense undergrowth, but containing sufficient trees for concealment. It should be large enough to accommodate the force without crowding. Water supply should be convenient.

(2) Close reconnaissance. The composition of advance guards should include one or more unit gas officers. In case a gassed area is encountered, a gas officer should determine its extent, and seek a means of avoiding or passing through it with the least possible delay or danger to the column. Guides or signs should be posted as necessary to inform the main body of these gassed areas and the alternate routes to take in order to avoid them. An advance guard should be equipped to deal at once with minor gas situations as encountered.

When the main body deploys for advance on a broad front, unit gas officers, assisted as necessary by gas noncommissioned officers, should reconnoiter for gassed areas in the path of the advance, and inform their commanders of the localities.

b. Contact. After contact is gained, and throughout battle, unit gas officers are engaged continuously in chemical reconnaissance. They should study the terrain in the unit areas, note suitable localities for use of gas by the enemy, and be prepared to make recommendations for the disposition of the unit for gas protection. They should inspect gassed areas and inform their commanders of the kind of gas used and the danger involved.

Passage of Gassed Areas. Troops, upon encountering a gas-contaminated area, should, if possible, pass around it on its upwind side. If the passage must be made on the downwind side, it should be carried out quickly and gas masks should be worn. When it is impossible to pass around such an area, steps should be taken to insure maximum safety in passing through it. If there is a road, it usually will be desirable to use it. If there is no road, and the area is covered with underbrush, lanes should be cut through the area to enable troops to avoid contact with contaminated vegetation.

Terrain Considerations. High, open, bare ground is generally the safest from the viewpoint of gas protection. But low, wooded ground is that which provides concealment and cover from fire. The relative importance of these conflicting factors will vary in different situations. In many cases, in selecting positions for battle installation, some compromise, using reverse slopes of hills, may be practicable.

While gas clouds travel generally with the wind, their movement is affected materially by terrain. Woods and broken ground retard them. Deep valleys and ravines cause eddying air currents, which divert gas clouds from a straight path.

Small woods, which an enemy may well suspect of being occupied, are likely to be heavily gassed.

Chemical Attack From the Air. There do not appear to be any tactical measures for protection against chemical attack from the air, other than those which apply equally to other forms of air attack. Such general measures are concealment by night marches; use of concealed bivouac areas; such separation of units as is practicable, avoidance of main highways; provisions for warning of the approach of hostile aircraft; deployment; and anti-aircraft fire.

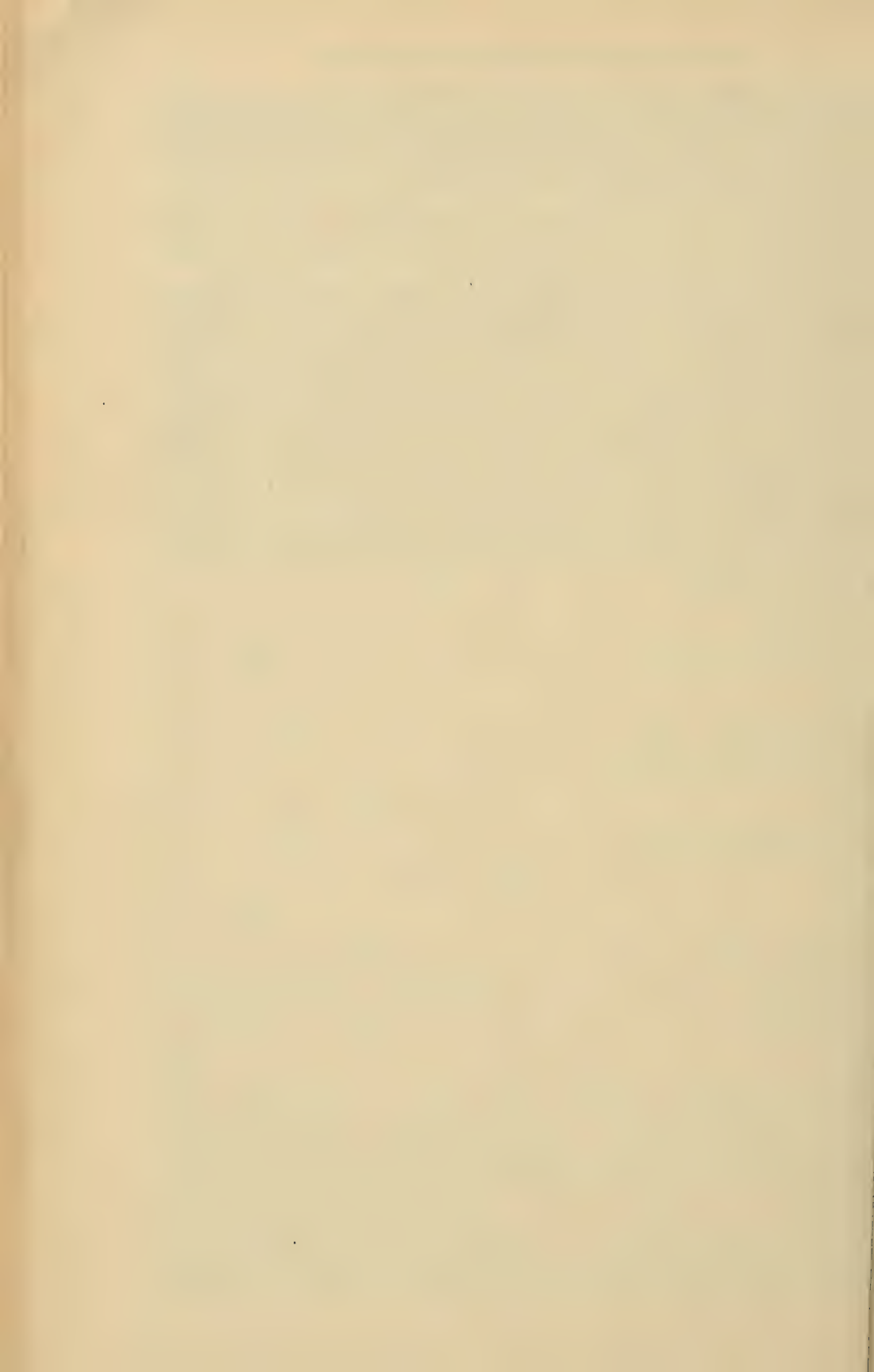
Upon warning of the approach of hostile low-flying airplanes, gas masks should be adjusted promptly. In case of a chemical spray attack, such vertical and overhead cover as available should be taken. A raincoat, paulin or shelter-half, if it can be thrown over the body in time, will give immediate protection, but, if contaminated, it must be discarded after the attack is over. Troops in covered vehicles are protected from such spray, provided they wear gas masks. When the hostile planes have passed, troops should be moved out of the gassed area and first aid and decontamination measures taken at once. Trees provide very little protection from chemical spray.

Plans of Protection. A force in bivouac, where it is subject to chemical attack, or occupying a defensive position, should prepare plans for gas protection for that locality. These plans provide a coordinated scheme for occupation of an alternate position by each unit in

case its original position is rendered untenable with persistent gas. The plans must insure against selection of the same alternate position by two or more units, and avoid movements which might jeopardize the safety of the force, or interfere with the accomplishment of its mission. An important area should be evacuated only when it is certain that the enemy is employing persistent gas in such quantity as to render the area unsafe to occupy, and not merely for harassing purposes.

Offensive Action. Hostile preparations for chemical operations, such as installation of Livens projectors or other chemical weapons, whenever discovered, should be disrupted by fire or such other offensive action as is practicable.

Action During and After Gas Attack. When the gas alarm is sounded, or a hostile gas attack is launched, troops adjust their masks and take such cover as is afforded. The doors of gas shelters, if provided, are closed; any fires for heating same are put out to avoid drafts; and supplies and equipment, in so far as practicable, are covered to protect them from gas. Troops in forward positions prepare to resist an attack by hostile infantry. Unit gas officers note the intensity of the enemy's fire, identify the kind of chemical used, and if necessary, obtain samples of the agent and forward them to the rear for examination. If a persistent vesicant agent is used, unit gas officers determine and report the extent of the gassed area, estimate the danger of continued occupation of the unit's position, and, where necessary, make recommendations to their commanders for the removal of the troops to another position. After the gas attack is over officers guard against any relaxation of vigilance in their commands, since one gas bombardment is likely to be followed by another. As soon as practicable, casualties are evacuated, and such degassing or decontamination measures as are required are undertaken.



CHAPTER IX

MAP READING

INTRODUCTION

Map Reading for the Medical Officer. Map reading is an essential subject for the officer of the Medical Department. It is vital for officers assigned to duty with medical detachments of regiments of infantry, cavalry, or field artillery, or to the medical regiment or squadron of infantry or cavalry divisions. During marches, in campaign or battle, as well as in maneuvers and garrison service, the personnel of the department must provide continuous and adequate medical care, in whatever trying circumstances may be presented, in order to accomplish the important missions with which it is charged. This service must be taken to the troops. Medical units must move with the same facility, by the same general means, and for the same reasons. They must move and displace to new locations as the tactical situation changes and as the troops advance or retire. The statement, "Terrain is a tyrant," applies to the medical officer, in the execution of his field duties, to the same extent as to the officer of the arms and for the same reasons. Maps picture terrain. The location and nature of roads and railroads, of cities and villages, of streams and the ridge lines which control their flow, of woods and forests, and cultivated fields are all shown on military maps. The nature of the terrain will usually determine the exact location of any tactical installation. *The map is a primary fighting instrument of the officer.*

A knowledge of map reading is necessary in order to understand orders which are received. The width and depth of the areas utilized in action by the infantry or cavalry division may extend over several miles. The single factor of time will usually preclude that complete and definitive terrain reconnaissance which would be necessary if maps were not used. Immediately the medical officer receives the commander's tactical plan he will start the preparation of the medical plan to support it. Map study will facilitate his understanding of his task. It will indicate areas which should be visited in order to make a wise choice of locations for medical installations, as it will also enable him to eliminate from consideration entire areas which are thus disclosed to be unsuitable. His own order is likely to be issued with reference to a map. He must not permit himself to rely entirely on maps to the exclusion of ground reconnaissance. But he must use the one to supplement the other. On the battlefield the officer of any arm or service who lacks adeptness in the use of maps will be of doubtful value as a leader.

This knowledge need not, however, include all of the phases which are necessary for the officer of engineers, for example, nor as required by the infantry or field artillery officer who uses the map for purposes of fire control or adjustment. He will need to develop proficiency in the following specific map reading tasks:

- (1) Knowledge of conventional signs and special military symbols.
- (2) Location and coordinates, especially grid coordinates.
- (3) Measurement of map distances.
- (4) Direction and azimuth.
- (5) Elevation, relief, and terrain structure.
- (6) Use of the compass.
- (7) Practical application of map reading in the field.

Military Maps. While the military will use any and all maps, including aerial photographs, that come to hand, to the full extent of their capabilities, experience has indicated that certain types of maps are best suited to military needs. Therefore, maps constructed by the military will usually fall within one or another of the following classifications, as will maps of probable military use made by other government agencies:

a. The strategic map. A small scale (1:500,000) map, one sheet of which covers several hundred square miles. It is used by the commanders of major units, such as corps and larger.

b. The tactical map. A topographical map of a scale of about one inch to the mile (1:62,500). Sheets are produced, covering an area of 15 minutes of latitude by 15 minutes

of longitude, or about 20 miles on a side, by the *U. S. Geological Survey*. Such sheets are often called "quadrangles." This is the type of map expected to be most available and most useful in time of war. It is, therefore, considered the standard type for tactical operations within the division.

c. The terrain map. A large scale (1:20,000) topographical map showing the terrain in great detail. It is not expected that such maps will be available in quantity for field operations, and their present use is intended for indoor tactical instruction when it is impractical to utilize the terrain itself.

Conventional Signs. The purpose of a map is to convey to the reader accurate information concerning the various terrain features occurring in the area under study. The body of the map consists of signs or symbols, each representing some terrain feature occurring in that area. These are arranged on the body of the map in the same horizontal relationship, one to another, that the features themselves hold to each other on the ground. The symbols by which the ground features are represented are called *Conventional Signs*. These have been standardized and are published in FM 21-30. The map shown in Plate 1 contains most of the standard conventional signs used on both military and civilian maps. Conventional signs have been so devised that they picture or suggest the feature

CONVENTIONAL SIGNS SHOWN ON PLATE 1.

Numerical Key.		Alphabetical Key.	
1. Good motor road, paved.		Bench mark	52
2. Telephone or telegraph line.		Bridge, foot	42
3. Double track standard gauge railroad.		Bridge, highway, general	32
4. Stream or creek (blue on a four-color map.)		Bridge, highway, made of steel (S)	28
5. Fence, smooth wire.		Bridge, truss, or girder	30
6. Triangulation point or primary traverse station.		Bridge, suspension	25
7. Corn field.		Buildings in general	13
8. Fence, barbed wire.		City, town or village (generalized)	43
9. Tall tropical grass.		Combination showing city, town or village	24
10. River (blue on a four-color map.)		Crossing, railroad (RR above)	26
11. Woodland (deciduous trees.)		Crossing, railroad (RR beneath)	15
12. Lone trees.		Cemetery	23
13. Buildings in general.		Church	22
14. Orchard.		Accentuated (every fifth) contour	35
15. Railroad crossings, railroad beneath.		Cultivated field, corn	7
16. Fence of any kind.		Cultivated field, sugar cane	13
17. Schoolhouse.		Cut	29
18. Cultivated field, sugar cane.		Dam	20
19. Grass-land in general.		Demolitions (ruins)	39
20. Dam.		Electric power transmission line	21
21. Electric power transmission line.		Fence of any kind (or board fence)	16
22. Church.		Fence, barbed wire	8
23. Cemetery.		Fence, smooth wire	5
24. City, town or village.		Fence, stone	46
25. Bridge, suspension.		Fence, worm	45
26. Railroad crossing, railroad above.		Fill	27
27. Fill.		Ford, equestrian	48
28. Bridge, steel (S).		Ford, for vehicles	40
29. Cut, railroad.		Grass-land in general	19
30. Bridge, truss or girder, for standard gauge RR.		Grass, tall tropical	9
31. Narrow-gauge railroad.		Marsh in general	50
32. Bridge, highway, general.		Mine or quarry of any kind (or open cut)	34
33. Railroad, single track, standard gauge.		Orchard	14
34. Mine or quarry of any kind (or open cut).		Pasture or grass-land in general	35
35. Accentuated (every fifth) contour.		Railroad, double track, standard gauge	3
36. Wire entanglement.		Railroad, narrow gauge	31
37. Low or portable entanglement.		Railroad, single track, standard gauge	33
38. Trenches (dotted when proposed).		River (blue on a four-color map)	10
39. Demolitions (Ruins).		Road, good motor, paved	1
40. Ford, general symbol for vehicle ford.		Road, poor motor or private, unpaved	49
41. Good pack trail or foot path.		Schoolhouse	17
42. Bridge, foot.		Stream or creek, intermittent	44
43. City, town or village (generalized).		Stream or creek, perennial (blue on a four-color map)	4
44. Intermittent stream.		Stream, head of	51
45. Worm fence.		Tank trap	47
46. Stone fence.		Telephone or telegraph line	2
47. Tank trap.		Trail or foot path	41
48. Equestrian ford.		Trees, lone	12
49. Road, poor motor or private, unpaved.		Trees, deciduous	11
50. Marsh in general.		Trenches (dotted when proposed)	38
51. Head of small stream.		Triangulation point or primary traverse station	6
52. Bench mark, Elev. 555 ft.		Wire entanglement	36
		Wire entanglement (low or portable)	37
		Woodland (deciduous trees)	11

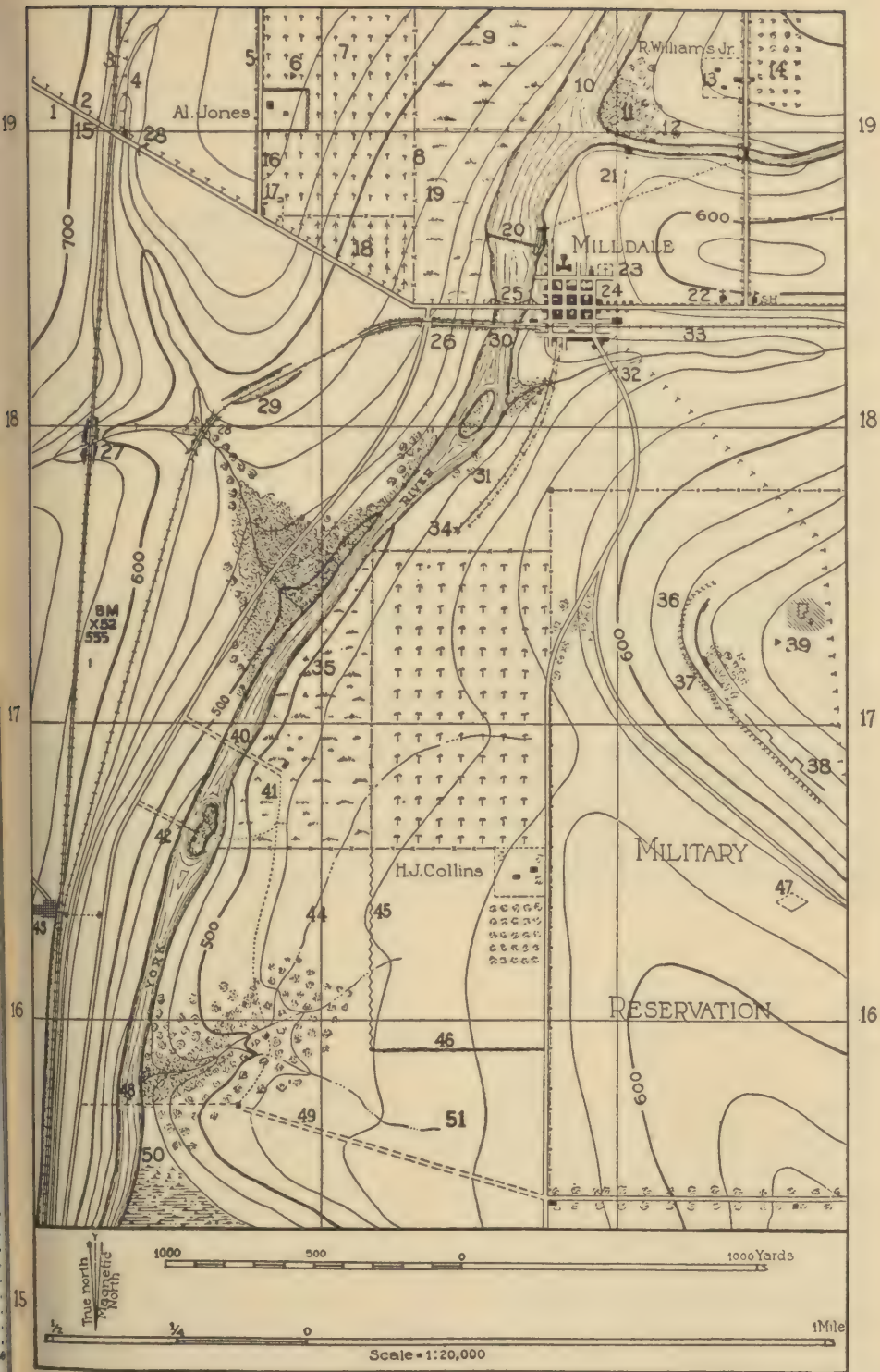


Plate 1. Conventional Signs.

that they represent. Further to increase their value and ease of identification, the standard maps are printed in four colors, as follows:

- a. *Black* for the works of man, names, and the grid.
- b. *Blue* for water.
- c. *Green* for woods and other vegetation.
- d. *Brown* for contours and other forms of relief portrayal.

Marginal Information. The following items of marginal information usually appear on standard military maps:

- a. Harriman index number of the map and the location in the Harriman index of the quadrangle shown on the map sheet. The Harriman index system is explained in *TR 190-7*.
- b. Name of the state or states within which the mapped area lies, and the name of the quadrangle or area.
- c. Its scale, showing both the representative fraction, and mile and yard graphic scales.
- d. Its orientation with the local magnetic declination and probable annual change.
- e. Explanation of any symbols appearing that have not been adopted as standard.
- f. The contour interval.
- g. Name of the organization which issued the map.
- h. The date of issue or revision.
- i. The names of the organizations executing the surveys, date of surveys, and any compilation sources.
- j. The projection used.
- k. The horizontal datum.
- l. The vertical datum.
- m. The zone of the military grid, including reference to overlap zone, if any.
- n. The designations of the geographic grid lines.
- o. The designations of the military grid lines.
- p. The names of adjoining map sheets.
- q. An index of the adjoining map sheets (sometimes).
- r. The filing name.

Special Military Symbols. The map is used as a plotting board upon which to record the dispositions and locations of the enemy and our own troops, and upon which to plan the details of operations. For this purpose a series of symbols have been devised. These are known as *Special Military Symbols* and by means of them the size, identity, and designation of the various units and installations, the location and type of auxiliary weapons, and the various lines and boundaries involved in an operation can be indicated. See Plate 2.

Symbol indicating size

Basic symbol

(a) Smaller unit

Superior unit

Example: 1st Battalion, 2d Infantry



Symbol indicating size

Symbol of arm or service

(b) Company, troop, battery, flight

Weapon

Division, brigade, regiment, separate battalion, separate company.

Example: Battery E, 62d Coast Artillery, Antiaircraft, Machine Gun



Symbol indicating size

Army or corps

Example: Second Army



LIST OF BASIC SYMBOLS.—To indicate purpose or character of activity.

Military post or station; command post or headquarters



(lower end of staff terminates at location of establishment represented)

Troop unit



(On large-scale maps where troop units can be shown to scale, this symbol may be modified as follows so as to show area occupied by units in column or line and direction in which they are facing:

Line



Column



Airdrome



Airship hangar



Airship mooring mast



Airport (landing field)



Airport (landing field advanced)



Autogiro



Ammunition



Arsenal



Arsenal (gas generating)



Balloon, ascension point



Balloon bed



Balloon barrage ascension point

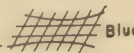


Barrage

Blue 155-mm How

(size indicating the extent, and notation indicating type)

Demolitions



Depot (supply point)



(Temporary depot in combat zone)



Debarcation or embarkation point



Dugout:

Isolated



In trench system



Gas-proof

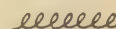


Entanglement

Wire



Concealed



Gas:

Area to be avoided



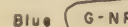
Area blanketed by smoke (time effective)



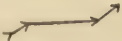


Area probably affected by gas cylinder cloud





Area to be gassed, nonpersistent



General hospital	
Laboratory, experimental station, or proving ground	
Leader gear	
(An energized cable which may be provided to aid the safe pilotage of vessels through free passages in mine fields. Symbol is used on chart to show exact location.)	
Message center	Msg Cen

Mines:

Individual (layout shown if practicable or area included) ..  or  Mine field

Chemical land mine

Contact mines

(This symbol is used to indicate the actual number of mines and their locations. The arabic figures indicate the contemplated number of mines in each line.)

Controlled mines

(This symbol indicates one 19-mine group, and a separate symbol is used for each group. As it appears here, the upper edge of this page is assumed to be seaward; and on charts the symbols should be correspondingly placed. The length of a mine group being 1800 feet, the symbol is drawn to scale. Its position represents the contemplated disposition of the mine group.)

Mobilization point or area (capacity in figures)

Net:

Torpedo net (with gate)

Antisubmarine net (with gate)

Obstacle:

Individual

Road block

Bridge out

Post:

Observation

Fixed underwater listening

Visual signal

Point, any located (suitable description)

Point, distributing:

For class I supplies

Ammunition

Artillery ammunition

Small-arms ammunition

Water

Prisoners of war

Procurement district, headquarters

Railway center

Railhead

Reception center

Replacement training center

School, commonly used

Found occasionally on old maps ..

Supply. (See Depot.)

Ammunition, all classes

Ammunition, artillery

Ammunition, small arms

Class I

Gas and oil








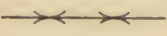
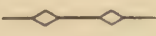











Water








Trains (supply, motor):

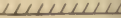









Animal-drawn


Pack


Railway


Searchlight		Cavalry:	
Sound locator		Horse	/
Signal:		Horse and mechanized	∇
Radio station	 or RS ⊙	Mechanized	⊙
Direction-finder station (radio compass)	RC ⊙ or 	Chemical Warfare Service	G
Intercept station		Coast Artillery:	
Switching central		Antiaircraft	A
Switching central (located at command post)		Harbor Defense	• HD
Test station or cable terminal ..	T Name	Railway	• Ry
Wire on ground		Tractor-drawn	• CA 155-mm
Traffic:		Engineers	E
One-way		Infantry	X
Two-way		Motorized	X M12
Tank:		Parachute	X Prcht
Barrier		Medical Corps	+
Trap		Military Police	MP
Trench for one squad		Ordnance Department	
(For each additional squad add one traverse.)		Quartermaster Corps	Q
Weather station		Bakery	
To indicate arm or service or its activity.—These symbols are placed within the symbols shown above when appropriate, except when otherwise noted.		Class I supplies	
Air Corps		Gasoline and oil only	
Airship		Remount Service	U
Balloon		Signal Corps	S
Balloon (motorized)		Signal Corps (aviation)	
Armored Force		Tank Destroyer	
(When used with arm or service symbol, indicates mechanized unit.)		Transportation Corps	
Artillery	•	Veterinary Corps	✓
		To indicate size of unit.—These symbols are placed above the symbols shown above, or are used for indicating boundaries as shown below.	
		Squad	•
		Section	••
		Platoon	•••
		Company, troop, battery, or Air Corps flight .....	|


Battalion, Cavalry squadron, or Air Corps squadron	II
Regiment or group	III
Brigade or Air Corps wing	X
Division or air force	XX
Corps	XXX
Army	XXXX
Service Command, department, or section of communications zone .	OOO
Communications zone	OOOO
General Headquarters	GHQ
Air Force Combat Command	 CC
Soldier	O
Automatic rifleman	•
Assistant leader, or second in command	•
Leader	•
Squad leader	•
To indicate boundaries and lines.	
Bombardment aviation, light (limit of radius of action)	 bomb(L) —
GHQ reconnaissance aviation (limit of zone of reconnaissance)	 GHQ ren —
Observation aviation (limit of zone of reconnaissance):	
Rear limit, army aviation	 obsn —
Rear limit, corps aviation	 obsn —
Air force reconnaissance aviation (limit of zone of reconnaissance)	 AF ren —
Pursuit aviation (limit of radius of action)	 pur —
Squad	— • —
Section	— •• —
Platoon	— ••• —
Company or similar unit .....	— | —
Battalion or similar unit ...	— || —
Regiment or similar unit .....	— ||| —
Brigade	— X —


Division	— XX —
Corps	— XXX —
Army	— XXXX —
Corps area, department, or section of communications zone	— OOO —
Communications zone	— OOOO —
Rear boundary of theater of operations	— GHQ —
Front line	
Limit of wheeled traffic by day	— DY —
Limit of wheeled traffic by night	— NT —
Line beyond which lights on vehicles are prohibited	— LT —
Outpost line	— OPL —
Main line of resistance	— MLR —
Regimental reserve line	— RRL —
Limiting point	— ⊗ —
Line of communication	— LC —
Line of departure	— LD —
Straggler line	—  —
Prisoner of War Inclosure, IV Corps.	XXXX PW II
Weapons.	
Automatic rifle	—  —
(Dotted when emplacement is not occupied, thus)	—  —
Machine gun	—  —
(Arrow points in principal direction of fire. When used alone it indicates machine gun, water-cooled, cal. .30.)	
(Machine-gun symbol under symbol of unit of any arm indicates machine-gun unit of that arm)	
Antiaircraft	—  —
Antitank gun (specify caliber) ..	—  75 AT —
Antitank gun in position, showing principal direction of fire (indicate caliber by numeral)	—  75 AT —
Antitank gun emplacement with principal direction of fire	—  37 AT —
Caliber .50	—  .50 —


Light 


Machine gun (single gun) 
 (Arrows indicate sectors of fire; shaded portion shows danger space when fire is placed on final protective line.)


Machine-gun section (two guns) .. 


Gun 


Gun battery .. 


Howitzer or mortar 

Howitzer or mortar battery 


4.2-in. chemical mortar 


Open when em placement is unoccupied, thus 


Livens projector 

Mines, chemical land (individual) .. 

Special symbols for use in hasty sketches and on operations maps.


Area occupied by a unit (2d Battalion, 3d Field Artillery) 

Area occupied by corps troops (III Corps) 


Brush 


Cultivated land 

Stream 

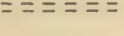
Woods 


Roads.—Suggested road classification is shown below. This classification will not apply in all cases. When additional types are indicated suitable identification should be made by improvised notation or legend.

Hard surface 

Graded and improved 


Graded, not improved 


Poor road 


Trail 


APPLICATION OF SPECIAL SYMBOLS.—The following examples show the use of special symbols as applied to various military organizations and activities. These examples are intended to illustrate the method of combining basic symbols and abbreviations in order to show the desired information. These are only a few of the possible combinations. Many are more complete than necessary. Often the number of a unit, to those familiar with it, will indicate its activity.


Air Corps.


3d Air Force  3 AF


701st Air Base Group  701 AB


901st Transport Squadron  901 T


7th Observation Squadron  7 Obsn


88th Reconnaissance Squadron ..  88 Rcn


101st Balloon Squadron ..  101


1st Staff Squadron  1 Stf

301st Balloon Group  301


701st Bombardment Wing (Light)  701 Bomb (L)


532d Pursuit Group (Interceptor) ..  532 Pur (I)


Second Army Aviation  Second


203d School Squadron  203 Sch


Armored Force.


Headquarters Company, 1st Armored Division  1 Div


Military Police Platoon, Headquarters Company, 1st Armored Division  1 Div

Transportation Platoon, Headquarters Company, 1st Armored Division  1 Div


1st Reconnaissance Battalion  1 Rcn


Rifle Company, 1st Reconnaissance Battalion  1 Rcn


Weapons Platoon, 1st Reconnaissance Battalion  1 Rcn


Motorcycle Platoon, 1st Reconnaissance Battalion  1 Rcn

Armored Company (Light), 1st Reconnaissance Battalion  1 Rcn


1st Armored Brigade  1

Communication Platoon, Headquarters Company, 1st Armored Brigade  1 Brig

Headquarters Company, 1st Armored Regiment (Light)  1 (L)


Maintenance Platoon, Service Company, 1st Armored Regiment (Light)  1 (L)

Reconnaissance Company, 1st Armored Regiment (Light)  1 (L)

Machine Gun Company, 1st Armored Regiment (Light)  1 (L)


Company A, 1st Armored Regiment (Light)  1 (L)

69th Armored Regiment (Medium)  69 (M)

70th Tank Battalion, GHQ Reserve Cavalry.  70 (M) GHQ

Light Machine-gun Platoon, Troop A, 2d Cavalry  2

Scout Car Platoon, 2d Cavalry  2


1st Platoon, Troop E, 8th Cavalry  8


1st Platoon, Special Weapons Troop, 14th Cavalry  14


1st Platoon, Antitank Troop, 1st Cavalry Division  1 Div


Mortar Platoon, Weapon Troop, 2d Cavalry Brigade  2 Brig


1st Platoon, Troop A, 4th Cavalry Horse and Mechanized  4


2d Platoon, Troop G (Motorcycle) 4th Cavalry (Horse and Mechanized)  4

Headquarters Troop, 3d Cavalry Brigade  3 Brig

Troop A (Scout Car), 1st Reconnaissance Squadron  1 Rcn


Special Weapons Troop, 3d Cavalry  3


Troop E (Scout Car) 6th Cavalry (Horse and Mechanized)  6

Reconnaissance Troop (Mechanized) 9th Division  9 Div

1st Reconnaissance Squadron  1 Rcn

1st Cavalry Division  1

Command Post, 5th Cavalry  5

Observation Post, 9th Cavalry  9


Park, mechanized units of horse cavalry regiment  Pr

Park, Motor Transportation, 3d Cavalry  3

Chemical Warfare Service, 2d Platoon, 1st Chemical Company, Service Aviation  1 Serv Avn


10th Chemical Company, Maintenance  10 Maint


Company B, 2d Separate Chemical Battalion  2 Bn (Sep)


3d Battalion, 901st Chemical Regiment  901


Chemical Warfare Service Distributing Point, IV Corps  IV


Chemical Warfare Service Depot, First Army  First

Coast Artillery Corps, 55th Balloon Barrage Battalion  55 Barr


Searchlight Platoon, Battery A, 104th Coast Artillery  104


Machine-gun Platoon, Battery E, 102d Coast Artillery  102


37-mm Platoon, Battery F, 202d Coast Artillery  202

2d Battalion, 2d Coast Artillery, Harbor Defense  2 HD


912 Coast Artillery (Railway)  912 Ry

57th Coast Artillery (155-mm gun)  57 CA


77th Separate Coast Artillery Battalion (Antiaircraft, 37-mm)  77 Sep


4th Battalion, 241st Coast Artillery, Harbor Defense, Type C  241 HD (C)


Command Post, Battery E, 248th Coast Artillery, Harbor Defense, Type B  248 HD (B)


Corps of Engineers, Company A, 2d Engineers (combat)  2


12th Engineer Battalion (Triangular Division)  12


5th Engineer Squadron (Cavalry Division)  5


3021 Engineer Battalion (Separate)  302 (Sep)


301st Engineer Battalion (General Service)  301 Gen Serv


905th Engineer Battalion (Heavy Ponton, Motorized)  905 Hv Pon Mtz


2d Platoon, 70th Engineers (Light Ponton, Motorized GHQ Reserve)  70 L Pon GHQ


Engineer Depot No. 2, First Army  First


Engineer Park, II Corps  II

Bridge Company, 16th Engineer Battalion  16


2d Platoon, 391st Engineer Company (Depot)  391 Dep


Service Platoon, Company C, 801st Engineers (Water Supply)  801 W Sup


2d Platoon, Company B, 28th Engineers (Aviation)  28 Avn


Factory Platoon, Shop Company, 84th Engineers (Camouflage)  84 Com


Field Artillery.


Symbol may also be used to show artillery position area 


Battery F, 2d Field Artillery  F 2


Ammunition Train, 2d Battalion, 3d Field Artillery (Horse)  3 H


Headquarters Battery, 2d Battalion, 4th Field Artillery (Pack)  4 Pk


Gasoline Section, Service Battery, 54th Field Artillery Regiment (105-mm Howitzer, Armored)  54


1st Battalion, 8th Field Artillery  8


Headquarters and Headquarters Battery, 11th Field Artillery Brigade  11 Brig

2d Battalion, 18th Field Artillery (Composite)  18 Comp

Service and Ammunition Battery, 1st Battalion, 79th Field Artillery (240-mm Howitzer, Motorized)  79

2d Section, Battery B, 71st Field Artillery Battalion, Horse-drawn  71 H-Dr

Maintenance Section, Battery C, 98th Field Artillery Battalion (75-mm Howitzer, Pack)  98 Pk

Battery B, 1st Field Artillery Observation Battalion  1 Obsn

Headquarters Battery, 1st Division Artillery (Triangular)  1 Div

Tank Destroyer Battalion  TD


Infantry.


One squad, 2d Platoon, Company G, 117th Infantry  117

2d Heavy Machine-gun Section, Company D, 2d Infantry  2

1st Platoon Company B, 2d Infantry  2

Headquarters Company, 3d Infantry  3


3d Machine-gun Platoon, Caliber .50, Company M, 120th Infantry  120


1st Antitank Squad (Antitank Company), 1st Infantry  1


Command Post, 2d Battalion, 323d Infantry  323

Automatic Rifle Squad, 2d Platoon, Company A, 1st Infantry  1


Intelligence Platoon, Headquarters Company, 22d Infantry  22


1st Light Machine-gun Squad, Company F, 309th Infantry  309

Mortar Section, Company C, 18th Infantry  18


Service Platoon, Headquarters Company, 105th Antitank Battalion  105 AT

Weapons Platoon, Company E, 6th Infantry (Armored)  6

3d Platoon, 205th Military Police Company  205


501st Infantry Battalion (Parachute)  501 (Prcht)

8th Infantry (Motorized)  8 Mtz

1st Infantry Train  1


Kitchen Train, 2d Battalion, 3d Infantry  3


Observation Post, 81-mm Mortar Platoon, Company D, 30th Infantry  30


Medical Detachment, 5th Infantry  5 Inf


1st Battalion Section, Medical Detachment, 175th Infantry  175 Inf


Medical Department.


Veterinary troops  1


Headquarters and Service Company,
1st Medical Regiment H & S  1


Clearing Company D, 8th Medical
Battalion D  8


1st Platoon, Company E (Ambu-
lance), 105th Medical Regiment E  105


Station Platoon, Company G (Clear-
ing 105th Medical Regiment G  105


3d Platoon, Collecting Company,
47th Medical Battalion Armored 3 A  47


Clearing Platoon, Veterinary Troop,
1st Medical Squadron 3 Vet  1


First Army Medical Depot  First


Battalion Aid Station, 1st Battalion,
4th Infantry I  4 Inf


Ambulance Loading Post  ALP


Collecting Station, 1st Division  1 Coll


11th Evacuation Hospital  11 Evac

Clearing Station, I Corps  I Clr


Hospital Train  00


Veterinary Clearing Station, First
Army  First Clr


5th Platoon, 12th Veterinary Com-
pany 5  12


901st Veterinary Evacuation Hospi-
tal  901 Evac


Ordnance.


1st Ordnance Company, Medium
Maintenance  1 M Maint


2d Ordnance Company, Heavy Main-
tenance (Army)  2 Hv Maint

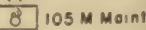
3d Ordnance Company, Heavy Main-
tenance (Tank)  3 Hv Maint (Tk)


Service Section, 28th Ordnance Com-
pany (Medium Maintenance)  28 M Maint


Magazine Platoon, 51st Ordnance
Company (Ammunition)  51 Am


3d Platoon, 95th Ordnance Com-
pany, Maintenance Railway Artil-
lery  95 Maint (Ry)

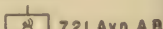
Company B, 19th Ordnance Battal-
ion (Armored) B  19

Headquarters and Supply Section,
105th Ordnance Company (Medium
Maintenance) H & S  105 M Maint


Service Platoon, 73d Ordnance Com-
pany (Depot)  73 Dep


462d Ordnance Company (Aviation,
Bombardment)  462 Avn (Bomb)


694th Ordnance Company (Aviation,
Pursuit)  694 Avn Pur

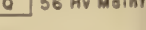
721st Ordnance Company (Aviation
Air Base)  721 Avn AB

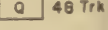
Quartermaster Corps.


Light Maintenance and Car Battal-
ion, 119th Quartermaster Regi-
ment 3  119

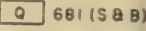
Company C, Truck Battalion, 105th
Quartermaster Regiment C  105

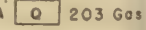
Company A (Truck), 13th Quarter-
master Battalion (Armored) A  13

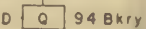
Shop Headquarters and Supply Pla-
toon, Company C, 56th Quarter-
master Regiment (Heavy Main-
tenance) C  56 Hv Maint

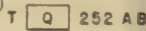
2d Platoon, Company K, 48th Quar-
termaster Regiment (Truck) 2 K  48 Trk

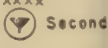
Pack Troop, 16th Quartermaster
Squadrons, 1st Cavalry Division E Pk  16

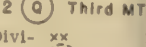
681st Quartermaster Battalion (Steri-
lization and Bath)  681 (S & B)


Service Platoon, Company A, 203d
Battalion (Gasoline Supply)  203 Gas


Company D, 94th Quartermaster
Battalion (Bakery) D  94 Bkry


Transportation Platoon, 252d Quar-
termaster Company (Air Base) T  252 AB

Second Army Quartermaster Depot
No. 1 (Gasoline and Oil)  Second


Third Army Quartermaster Depot
No. 2 (Motor Transport)  Third MT

Railhead for Class I Supply, 2d Divi-
sion  2 Rnd

III Corps Quartermaster Park Prk  III

Truckhead Class I Supply, 2d Divi-
sion  2 Trk hd

Signal Corps.

59th Signal Maintenance Company
(Aviation)  59 Maint






















Intercept Section Headquarters Platoon, 3d Radio Intelligence Company	Hq		3 Rad Int
1st Signal Company, Photographic			1 Photo
Operating Platoon, 1st Signal Troop, 1st Cavalry Division	Opn		1
Headquarters Platoon, 701st Pigeon Company	Hq		701 Pgn
Operation Company, 62d Signal Battalion	Opn		62
Construction Platoon, 30th Signal Company	Cons		30
7th Aircraft Warning Section, 2d Aircraft Warning Company	7		2 AW
Telephone and Telegraph Section, 313th Signal Company (Aviation)	Tp & Tg		313 Avn
1st Signal Platoon (Air Base)			1 AB
Point on axis of signal communication, 1st Division			1
Point on axis of signal communication, 1st Armored Division			1
5th Signal Battalion, Construction			5 Cons
317th Signal Company, Air Wing			317 Wg
Signal Company, Operation (Radio), 59th Signal Battalion, Armored Corps	Opn (Rad)		59
Signal Company, Operation (Wire), 59th Signal Battalion, Armored Corps	Opn (Wire)		59
1st Signal Company, Depot			1 Dep
2d Signal Company, Repair			2 Rep
1st Signal Company, Construction, Separate			1 Cons Sep
21st Signal Company, Operation, Separate			21 Opn Sep
3d Radio Intelligence Company			3 Rad Int
Position-finding Section 1st Platoon, 3d Radio Intelligence Company			3 Rad Int

Plate 2. Special Military Symbols.

LOCATION AND COORDINATES

Names. The naming of any named feature is the simplest and fastest method of identification. The names of cities, towns, rivers, lakes, mountains, woods, and similar features are invariably shown on maps. Military maps endeavor to show the names of *all* named features, particularly roads, hills, woods, and even farm houses, when known, further to facilitate identification and location. Because of their military importance the accurate identification of hills and of road junctions is especially desirable. On military maps, hills and road junctions are often given numbers for identification. The numbers so selected are the elevation of the feature in feet, and thus serve the dual role of identification and of conveying topographical information.

Location by Polar Coordinates. To indicate any specific location on a map it is sufficient to name the feature at the desired location, if it has a name. When the feature in question has no identifying name or number itself, it may be identified by giving its *distance* and *direction* from some close-by feature that is named. Thus (see Plate 1) it is sufficient to say, "Road junction one-half mile south of MILLDALE," or, "Orchard just east of R. WILLIAMS, JR.," to identify the features in question. If greater accuracy is needed because of difficulty in describing the feature, the distance may be accurately measured in yards and the direction given in terms of azimuth. This is called the "polar coordinate" method of indicating location.

Location by Grid Square. To facilitate the reading of military maps a grid system is printed thereon. The grid is a series of horizontal lines (known as the *x*-grids) and vertical lines (known as the *y*-grids) spaced 1000 yards apart. These lines are numbered in one series from left to right, and in another series from bottom to top. The combination of these horizontal and vertical lines is known as the "military grid," and they divide the map into 1000-yard squares. Any square can be indicated by giving the numbers of the two grid lines that form the beginning (west edge and south edge) of the square. *The left-to-right reading is always given first, and the bottom-to-top reading last. In*

Plate 1 the vertical grids are numbered at the top and are 40 to 42, inclusive; the horizontal grids are numbered on both sides of the sheet and are 15 to 19, inclusive. To indicate location of features on maps of unfamiliar territory, much time is saved by indicating the feature and the grid square in which the feature is found. This reduces the amount of searching to an area 1000 yards square. The road junction and the orchard identified by polar coordinates in the preceding paragraph could have been identified, as follows, by the grid-square method.

"Road junction (41-17)."

"Orchard (42-19)."

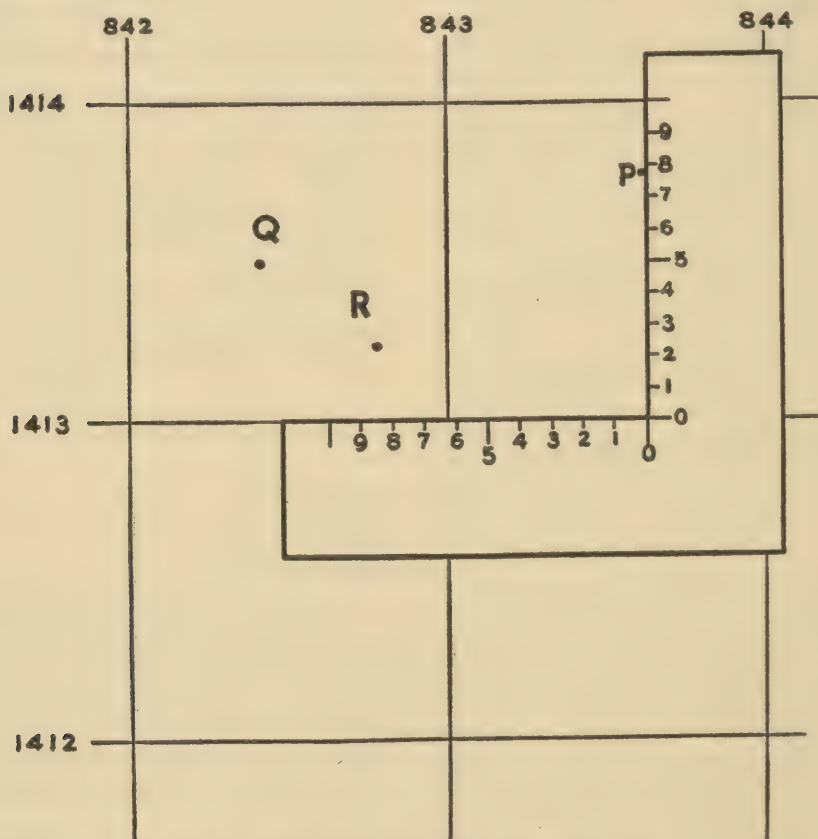


Plate 3. Using the "L" Shaped Coordinate Card.

The coordinates of point "P" are (43.63 — 13.77).

Location by Grid Coordinates. It is frequently necessary to give the location of some feature with great exactness, or to indicate a point on the side of a hill, or in an open field. This is done by indicating the exact position within its proper grid square at which the point occurs. For example, the road junction in Plate 1, used in previous examples of location, appears to be about nine-tenths of the distance across its grid square, reading toward the right from the 41 grid, and about five-tenths of the distance up from the 17 grid. Its grid coordinates therefore would be expressed (41.9—17.5). Coordinates are always written as two figures, separated by a dash and inclosed in parentheses as above. The left-to-right reading is always given first, followed by the bottom-to-top reading, which can be remembered through the key phrase, "READ RIGHT UP." The interpolated figures showing position within the grid square are shown as decimals, following their key grid (as .9 follows 41, and .5 follows 17, above). They can be read to tenths or to hundredths, according to the accuracy desired. Since the squares measure 1000 yards

on a side, a reading to tenths (one decimal) gives location to a 100-yard accuracy, while a reading to hundredths (two decimals) gives an accuracy of ten yards. When the grid line numbers run into several digits, it is customary to drop all but the last two digits of the x and the y grids. For example, grid number (1941—2117) ordinarily would be written (41—17).

The Coordinate Card. The reading or plotting of grid coordinates is greatly facilitated by the use of the coordinate card. This card is, in effect, a double scale that can be placed on the map and by means of which both the horizontal and the vertical interpolations can be made at one time. There are two types of coordinate cards in general use. One of them is "L" shaped, and the other is rectangular. The manner of using the cards is similar and is shown in Plate 3 and Plate 4.

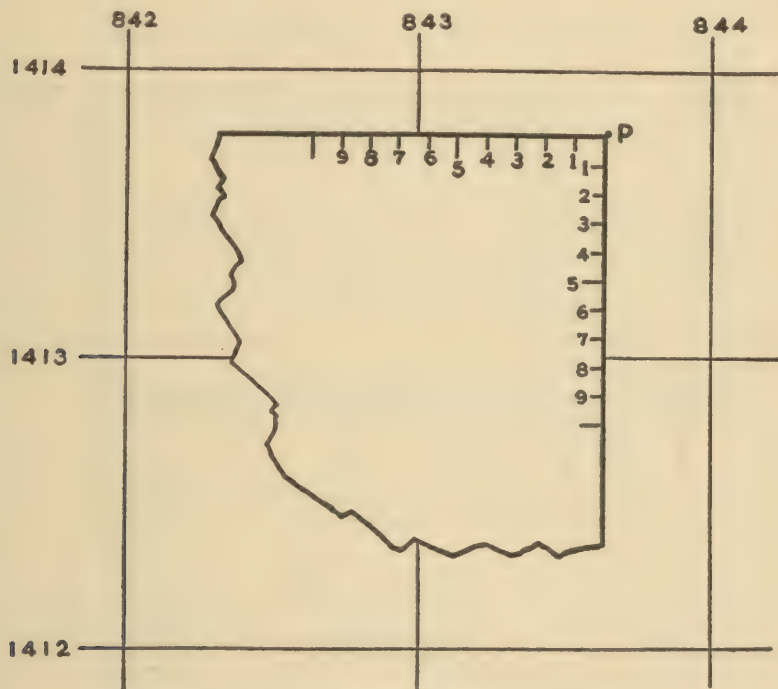


Plate 4. Using the Rectangular Coordinate Card.
The coordinates of the point "P" are (43.63—13.77).

In both cases, the sides of the cards must be parallel to the grid lines when used. The cards are divided into tenths, and when read to the nearest graduation will give a reading to one decimal, or to a tolerance of 100 yards. When readings to two decimals, or to ten yards, are desired, the graduations are further subdivided into tenths, by inspection.

Coordinates on the 5000-Yard Grid Maps. The smaller scale maps, such as the tactical map (1:62,500), often show every fifth grid line only, thus dividing the map into 5000-yard squares. In indicating location by the "grid-square" method it is sufficient to indicate the squares as they appear on the map. To indicate exact location by the grid coordinate method, however, it is necessary to allow for the intermediate 1000-yard grids that are omitted from the map. For this purpose a special coordinate card is used, dividing the 5000-yard unit into five 1000-yard divisions for the missing intermediate grids, and further subdividing each of these 1000-yard units into tenths (or 100-yard units). Such a coordinate card and its method of employment is shown in Plate 5.

DISTANCE AND TIME

The Graphic Scale. One of the most important uses of the map is to determine distances between points on the ground. This is done by means of a map scale, thus the basic data found on all military maps includes a scale, which consists of one or more lines divided into equal divisions, and each division marked with the distance which it represents on the ground. These are the *graphic scales* and are used for the measurement of distances. There will be one such scale graduated into mile units for use in computing data needed for marches and movements. There will be another such scale graduated to permit direct measurements in terms of yards for the computation of ranges, depths, and frontages. (See Plate 6). On many maps, an additional graphic scale will be shown graduated to permit

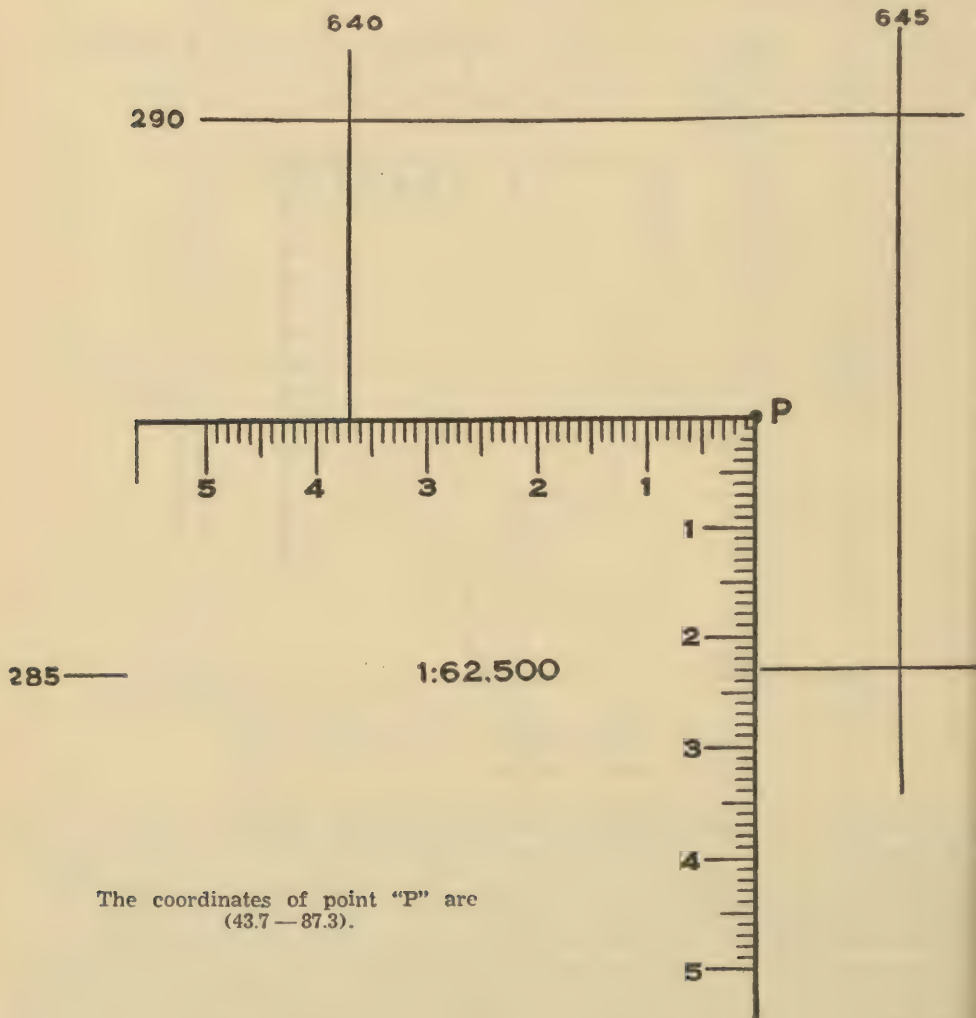


Plate 5. Reading Coordinates on the 5000-Yard Grid.

readings in kilometers and meters (an aftermath of having fought the World War in Europe). Each scale consists of a *primary scale* divided into convenient major divisions of ground distance, and an *extension* at the left consisting of one of the major divisions subdivided into tenths or other appropriate fraction.

Measuring Distance on the Map. The graphic scales are a printed portion of the

map, and therefore cannot be moved around on the face of the map, as a ruler would be for example. A straight distance on a map is measured by laying the edge of a strip of paper along the line to be measured, and marking thereon *ticks* or short straight marks opposite the two points that form the limits of the line. The distance between these ticks corresponds to the map distance between the points. To determine the ground distance carry the marked paper down to the proper graphic scale. Place the right-hand tick accurately on that division of the primary scale which forces the other tick to fall within the *extension*. Read the total number of the primary divisions at the right end, and add

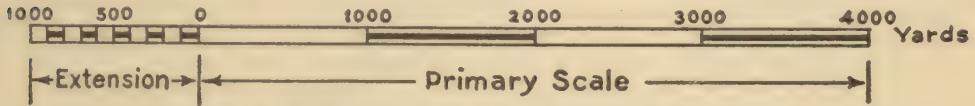


Plate 6. A Graphic Scale for Measurements in Yards.

the number of extension graduations shown at the other end. The combined reading will be the ground distance of the line measured. The distance between the two houses (center to center) in Plate 7 is 3000 yards of primary scale plus $\frac{1}{4}$ divisions of the extension, a total of 3425 yards.

Measuring Distance by Road. Road distance between two points, because of the bends and turns of the road, seldom can be measured in one operation as explained above. It is necessary to break the route to be measured into a succession of straight parts, commonly called *legs*, plotting them in sequence direct from the map onto the edge of a strip of paper. (See Plate 8). The combined distance, so plotted, is then measured on the graphic scale (always in miles for marches and movements) as described in the preceding paragraph.

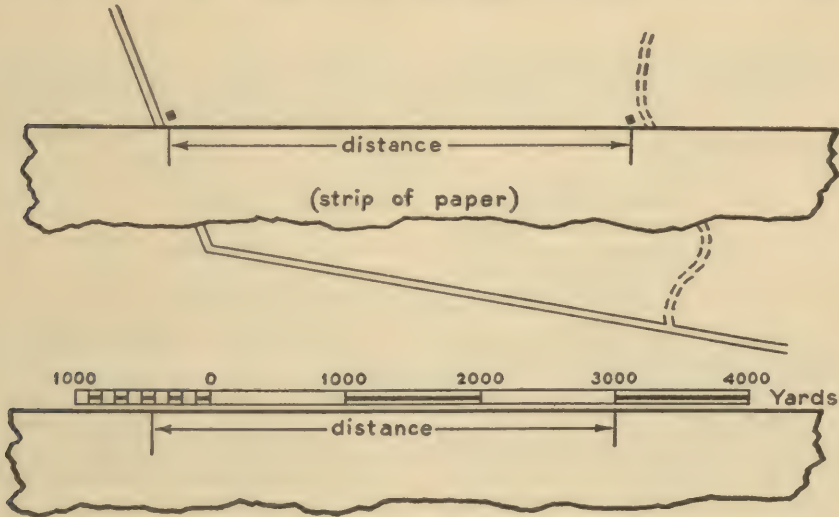


Plate 7. Measuring a Distance on a Map.

The Representative Fraction. The scale of a military map is indicated on the map not only by the graphical scale but also by a fraction called the "*representative fraction*" or "*RF*". This fraction or symbol expresses mathematically the relation which distances on the map bear to the distances on the ground. Thus in the case of a map bearing the symbol $\frac{1}{20,000}$, any distance measured on the map is one-twenty thousandths of the same distance on the ground; or, any distance on the ground would be twenty thousand times the same distance on the map. It ($\frac{1}{20,000}$) is also in effect, a statement that one unit of distance on the map corresponds to 20,000 units of distance on the ground. In the absence of any graphic scales, a ground distance can be determined from the representative fraction by

multiplying the map distance by the denominator of the RF of the map. Various maps have different scales, such as 1/10,000, 1/63,360, etc. Any representative fraction is a statement of the ratio of size between corresponding map and ground dimensions.

Determining the Representative Fraction. If the representative fraction is not shown on the map, due either to omission or to mutilation, it can be determined in the following manner. Select a line on the map that can be accurately located on the ground. Measure the line on the map and then measure the same line on the ground by tape, chain, pacing, or any acceptable method. We now have two measurements both pertaining to the same

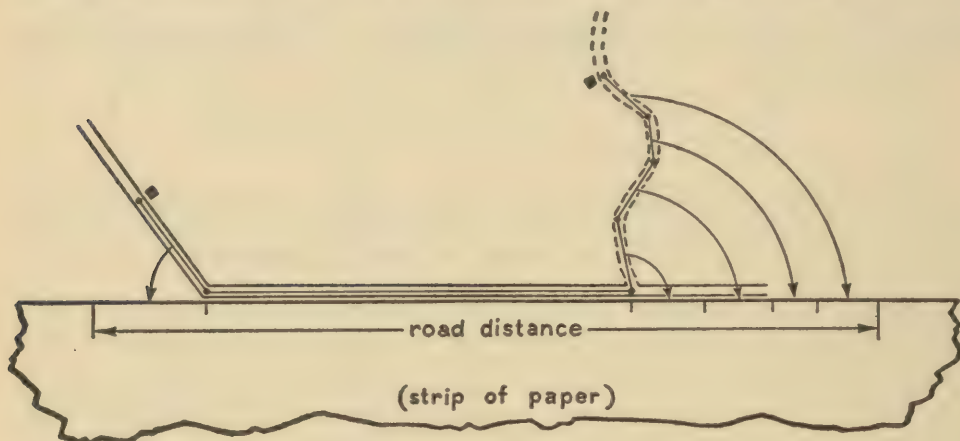


Plate 8. Measuring Road Distance.

line—one on the map in inches and one on the ground in yards or miles. Reduce the ground measurements to inches, so that *both measurements are in the same unit* and therefore can be compared. Reduce the equation so that the map side thereof is 1. For example, the distance between two houses measured on the map is 2.82 inches and measured on the ground is 1580 yards.

Map	Ground
2.82 inches on the map	= 1,580 yards on the ground
(Reduce to common terms)	
2.82 inches on the map	= 56,880 inches on the ground
(Reduce to a map value of "1")	
1 inch on the map	= 20,170 inches on the ground
(or)	1 = 20,170, the RF of this particular map.

If other maps of the same area are available, the ground distance could be secured from them instead of by measurement on the ground itself.

Words and Figure Scales. Scales may be expressed in words and figures, such as: "One inch equals one mile," which means that one inch on the map represents one mile on the ground. Such a scale can be converted to a representative fraction by reducing both sides of the equation to common terms. The above scale would then be "1 inch = 63,360 inches," and its RF would be written: 1:63,360. Representative fractions are always written with the numerator (map side of the equation) expressed as unity. Therefore a further conversion step may be required in cases such as the following:

"Three inches equals one mile."

$$\begin{aligned} 3 \text{ inches} &= 63,360 \text{ inches} \\ 1 \text{ inch} &= 21,120 \text{ inches} \\ 1 &: 21,120 \text{ (RF)} \end{aligned}$$

Constructing a Graphic Scale. For the purpose of determining distance data from a map, the graphic scale is the only type scale that is convenient to use, and for this reason is often called the *reading scale*. If such a scale does not appear on the map in convenient units, much trouble is saved by constructing one immediately. A graphic scale can be constructed for any map whose representative fraction is known or can be determined. For example, assume that a map shows no graphic scale, but shows a represen-

tative fraction of "1:20,000." It is desired to construct a graphic scale to make readings in terms of yards. The 1000-yard unit is the most convenient to use. 1000 yards equals 36,000 inches. Our problem can be stated, "Since 1 inch on the map is known to represent 20,000 inches on the ground, then how many inches on the map will it take to represent 36,000 inches on the ground." The above can be worked out as a problem in ratio and proportion, as follows:

$$\begin{array}{l} 1 : 20,000 :: X : 36,000 \\ 20,000 \times = 36,000 \\ X = 1.8 \end{array}$$

A line of convenient length is then drawn, and divided into divisions of 1.8 inches each, each of which will represent 1000-yard units of ground distance. The left division should be subdivided into tenths, by any convenient method, for the extension of the scale.

Converting Distance to March Time. The computation of the time required for troop movements is an essential item of military information obtained from maps. The rates of march of various types of troop units is known from experience. Foot troops are habitually computed as traveling, by road, by day, at a rate of $2\frac{1}{2}$ miles per hour. The distance to be marched, divided by the rate of march, will give the time required for the movement.

Example: A dismounted unit is to march from A to B. How long will it take? Points A and B are located on the map, and the road distance measured. It is found to be 11.4 miles. The rate of march is $2\frac{1}{2}$ mph.

$$11.4 \div 2.5 = 4.56$$

The march will therefore require 4.56 hours. March time is always expressed in hours and minutes. *All fractional parts of a minute are carried to the next full minute.* Four and 56/100 hours ($\times 60$) equals 4 hours and 33.6 minutes. Therefore the above march will require 4 hours and 34 minutes travel time.

Converting March Time to Distance. The distance that troops can move during a known elapsed time is an item that must frequently be determined. The time in hours multiplied by the rate of march will give the distance.

Example: A dismounted unit left A marching toward B at a known time. Where is the unit now? The rate of march is $2\frac{1}{2}$ mph, and the troops have been marching for 3 hours and 15 minutes.

$$3 \text{ hours } 15 \text{ minutes} = 3.25 \text{ hours}$$

$$3.25 \text{ (elapsed time)} \times 2.5 \text{ mph (rate)} = 8.125 \text{ miles (distance).}$$

The unit would be 8.125 miles from A. This distance is plotted on the edge of a strip of paper by means of the miles graphic scale, and is then scaled off along the road from A toward B.

Time-Distance Scales. When much work in determining distance and time of marches and movements must be done, it is of great convenience to construct a time-distance scale. Such scale is in reality a graphic scale divided into time units instead of into distance units. Such a scale for use in connection with movements of foot troops ($2\frac{1}{2}$ miles per hour) could be constructed as follows. From the miles graphic scale of the map draw a line to represent $2\frac{1}{2}$ miles which will therefore represent one hour of travel. Divide the line so drawn into twelve equal parts, each of which will then represent the distance covered in five minutes of travel time. To measure any given time-distance, use it exactly as a graphic scale, the full divisions representing full hours, and the subdivisions indicating the number of minutes of travel time. The scale might be divided into sixty parts, each representing one minute of travel. A time-distance scale for any other rate of travel could be constructed in a similar manner.

DIRECTION AND AZIMUTHS

Direction, General. The established geographic terms, *north, south, east, west, and northeast, southwest, etc.*, are used by the military to indicate general direction. Also the relative terms *right and left, front and rear*, are sometimes used in the field when they will serve the purpose. They are used in their generally accepted sense, except that the relative terms are based upon the direction that the unit is facing, rather than the individual; and, in combat, the direction of the enemy is always *front*. When a more accurate designation of direction is necessary the azimuth method is used.

The Azimuth Circle. The azimuth method is the established method of indicating direction in military map reading. The observer, or the point from which the direction is initiated, is presumed to be at the center of an imaginary horizontal circle (see Plate 9).

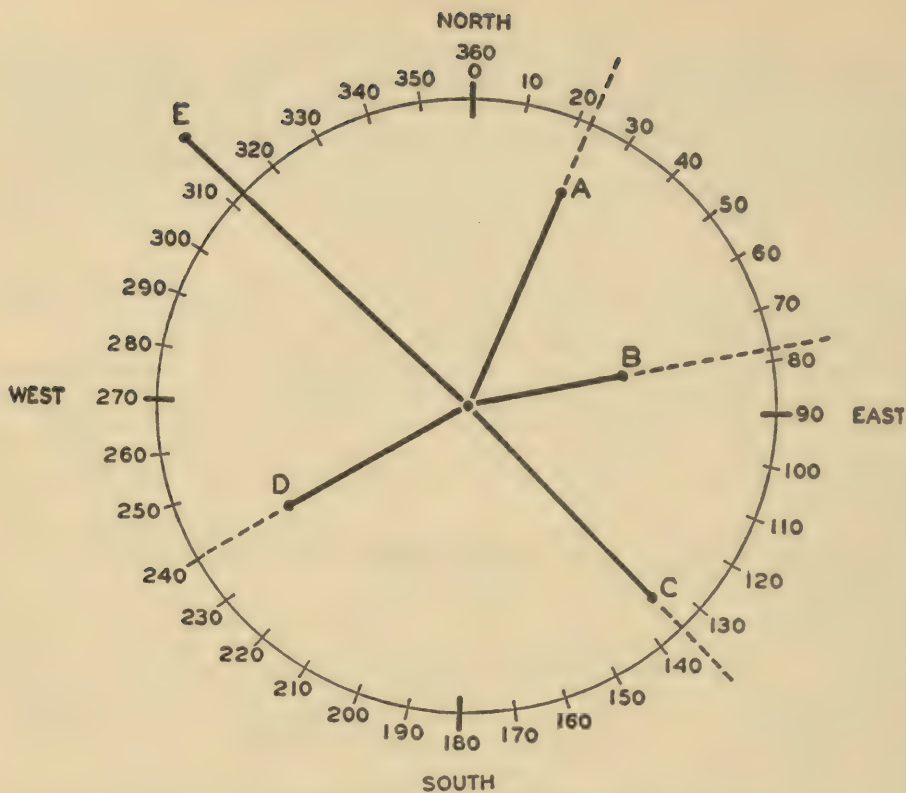


Plate 9. The Azimuth Circle.

The azimuths of A, B, C, D, and E are 22°, 78°, 135°, 240°, and 313°, respectively

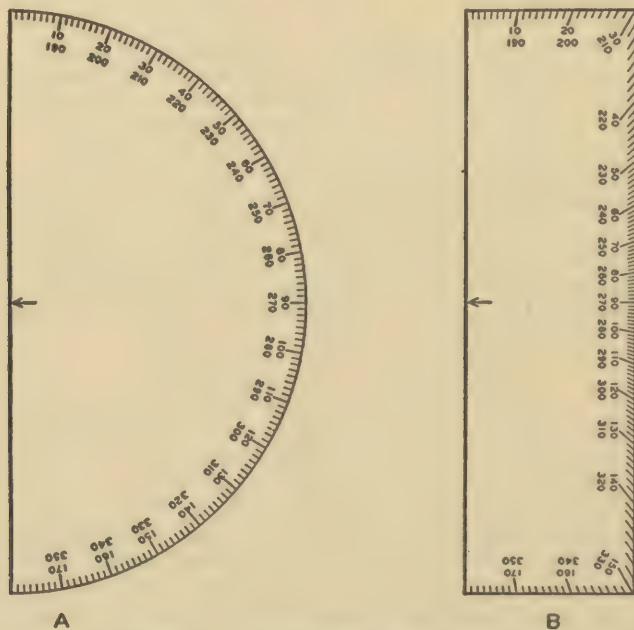


Plate 10. Map Reading Protractors.

A—Semi-circular Protractor. B—Rectangular Protractor.

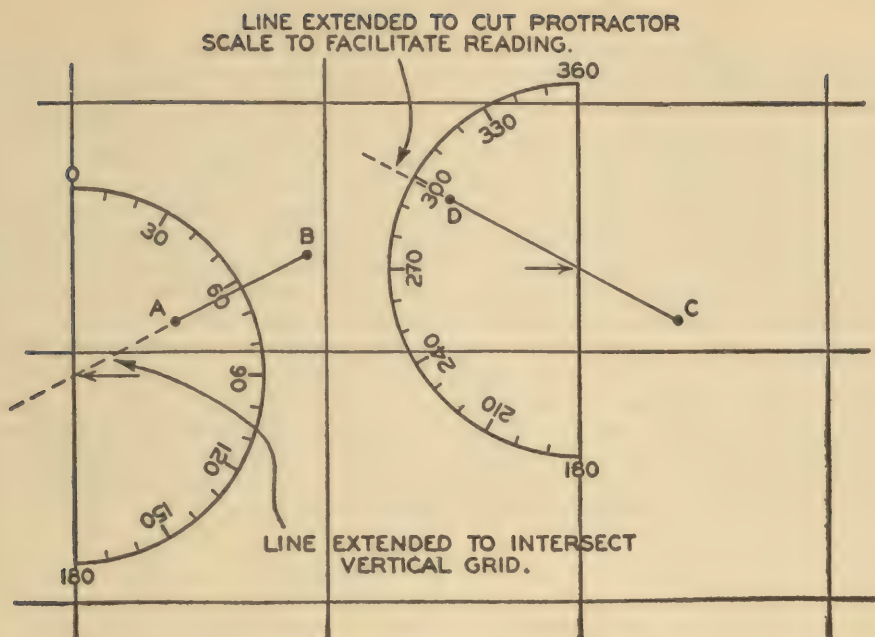


Plate 11. Measuring Map Azimuths.
The azimuth of the line A—B is 63° ; of C—D, 298° .

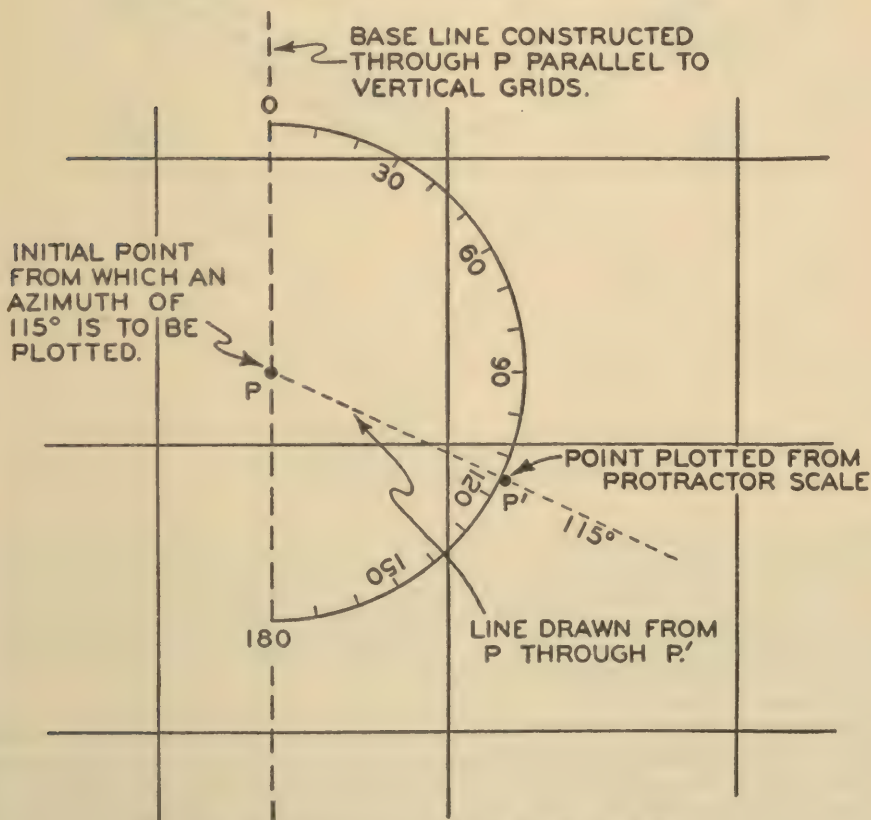


Plate 12. Plotting an Azimuth (115°) On a Map.

This circle is divided into 360 units of circumference measurement, called *degrees*. The degrees are numbered in a clockwise direction, the zero point being at the north, which automatically places the 90° -point exactly east, the 180° -point south, and the 270° -point west. The 360° -point will coincide with the 0° -point and be north. Direction by the azimuth method is expressed by giving the number of the degree on the circle at which a line drawn from the initial point through the point desired will pass.

The Protractor. Map azimuths are read with a protractor. Two standard types of protractors, semicircular and rectangular, are shown in Plate 10. Each protractor represents one-half of an azimuth circle. Two scales are usually shown, one reading from 0° to 180° for reading azimuths in the first half of the circle, and another showing readings from 180° to 360° for azimuths in the second half of the circle.

Measuring a Map Azimuth. To measure the azimuth of a line on a military map, extend the line to be measured, if necessary, until it crosses a vertical grid. (See Plate 11). Place the central index point of the protractor upon the intersection of the line with the vertical grid and register the base line of the protractor accurately on the grid line. If the direction of the line to be measured is to the east of the grid line, the reading is taken from the 0° - 180° scale. If the direction of the line is to the west of the grid line, the protractor is inverted, and the reading made on the 180° - 360° scale.

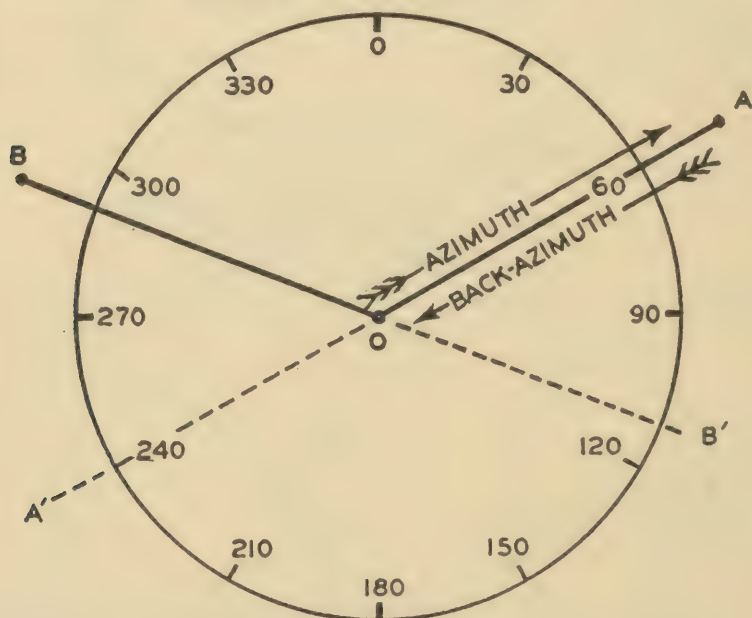


Plate 13. Back-Azimuths.

Plotting an Azimuth On a Map. To plot an azimuth on a map, construct a vertical base (zero) line through the point at which the azimuth originates. On a gridded map such a line would be parallel to the vertical grid lines. Register the protractor with its base line superimposed on the plotted line, and with its central index on the point at which the azimuth originates. Mark the point opposite the proper reading on the protractor scale and draw the line as shown in Plate 12.

Back-Azimuth. Every line has two azimuths, depending on the direction in which the measurement is made. On Plate 13 the azimuth of the line O-A is 60° . The azimuth of the same line measured from A back toward O (A-O) is 240° . This is the back azimuth of O-A. It is also the same as the azimuth of the line O-A', which is the extension of the line A-O. The back-azimuth of any line varies from its direct azimuth by exactly 180° , and so whenever the azimuth or the back-azimuth of a line is known its other azimuth

can be determined by subtracting or adding 180° . It is essential in dealing with azimuths always to indicate the direction of the measurement (O-A or A-O) and to specify *azimuth* or *back-azimuth*. On Plate 13 the azimuth of the line O-B is 290° ; its back-azimuth is 110° .

Intersection and Resection. *a.* An unknown point can be located by its azimuth and distance from some known point. (See polar coordinates.) A point can also be located if its direction from two points is known. For example, a new house has been built, and it is desired to enter it on the map. (See Plate 14.) The azimuth to the house is determined from the road junctions 482 and 516, and found to be 112° and 30° , respectively. These azimuths are then plotted on the map and their intersection is the location of the house. This is known as *intersection*, and is very useful when swamps, woods, or defiladed areas make measurement of distance impracticable.

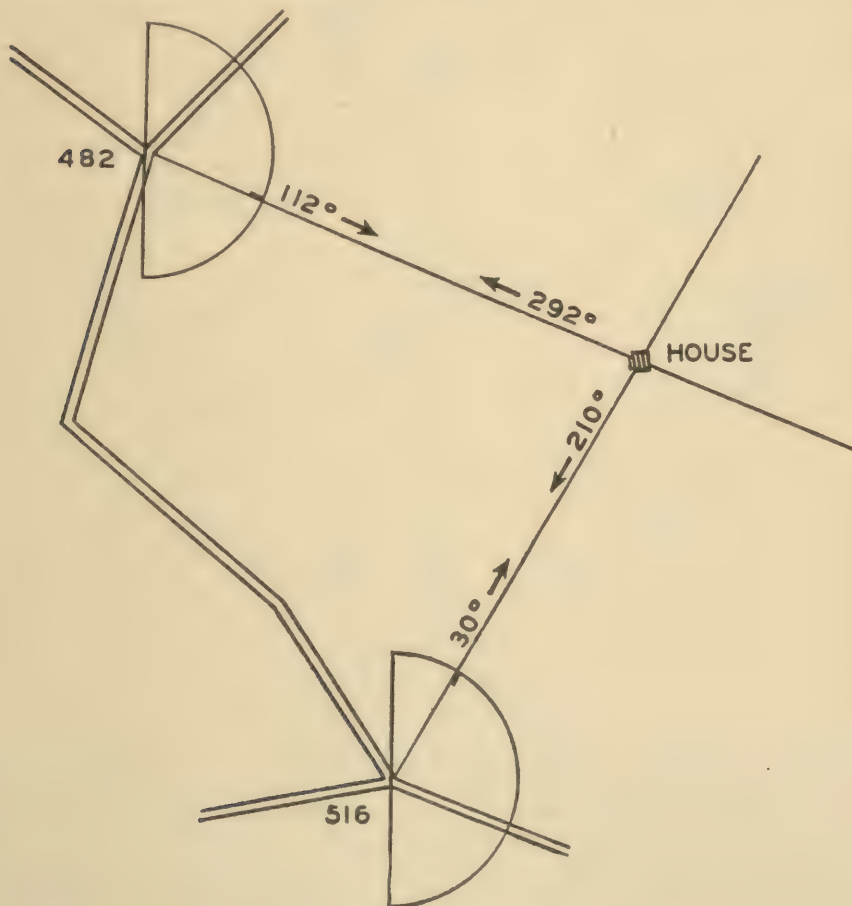


Plate 14. Intersection and Resection.

The azimuths from the road junctions to the house being known, their plotting gives the location of the house. Or the azimuths from the house to the road junctions being known, they can be converted to back-azimuths and plotted with the same result.

b. An observer who does not know his location can locate himself if he can get azimuth readings to two known points. In the above example presume the observer to be at the house, taking readings to the road junctions. In this case the readings would be 292° and 210° respectively. These readings *toward* the road junctions are then converted, mathematically, to their back-azimuths, which give the azimuth readings *from* the road

junctions, and so can be plotted as in *a* above. This is known as *resection*, and is the same process as intersection, except that the original readings are taken at the *unknown* point, and must be converted to back-azimuths before they can be plotted from the *known* points.

The Mil. Fire direction of artillery, machine guns, and other auxiliary weapons requires greater accuracy of direction than is possible with degree readings. For this purpose the military have devised an azimuth circle divided into 6400 units of measurement known as *mils*. (See Plate 15). Protractors and compasses are provided graduated in mils so that readings can be made direct in mil units without necessity for conversion. The method of reading and plotting azimuths in mils is the same as when using degrees.

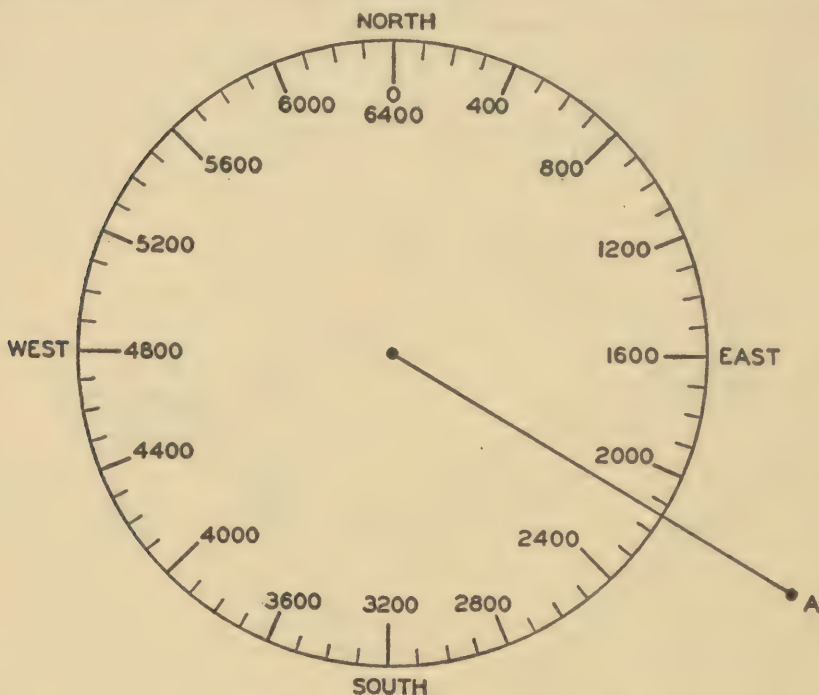


Plate 15. The Mil Azimuth Circle.
The azimuth of A is 2140 mils.

Declination. Direction is read on military maps by means of the grids, and such readings are called *grid azimuths*. Direction in the field is read with a compass whose magnetized needle points toward the north magnetic pole, and such readings are called *magnetic azimuths*. The grid north and the magnetic north do not coincide with the true north, nor with each other, except in very rare instances. It is necessary, therefore, to make an adjustment in order to use in the field azimuth data secured from the map, and *vice versa*. Military maps show the direction and the amount by which the grid north and the magnetic north diverge from the true north. These are known as the *grid declination* and the *magnetic declination* respectively. Plate 16 shows a typical orientation symbol as found on military maps. The following declination data is shown by this symbol in Plate 16:

Magnetic declination: $6^{\circ} 40'$ West (in 1935).

$6^{\circ} 52'$ West (in 1939).

Grid declination: $2^{\circ} 25'$ East.

The Grid-Magnetic Azimuth Adjustment. The three lines, grid north, true north, and magnetic north may occur in any one of several arrangements. The amount and direction by which the grid north varies from the magnetic north is the correction data

needed in map reading. The amount of this adjustment may be the sum of the declinations, or in other cases may be the difference of the declinations. Both the amount and the direction can be determined from the diagrammatic plotting of the orientation symbol, and the values given thereon. First study the symbol and determine the mathematical amount of the variation between the grid and the magnetic north lines as shown. (See Plate 17). Then note whether the magnetic arrow lies *inside* (right) or *outside* (left) of a clockwise azimuth measurement from the grid line. If it lies inside a clockwise measurement, the magnetic azimuth will be less than the

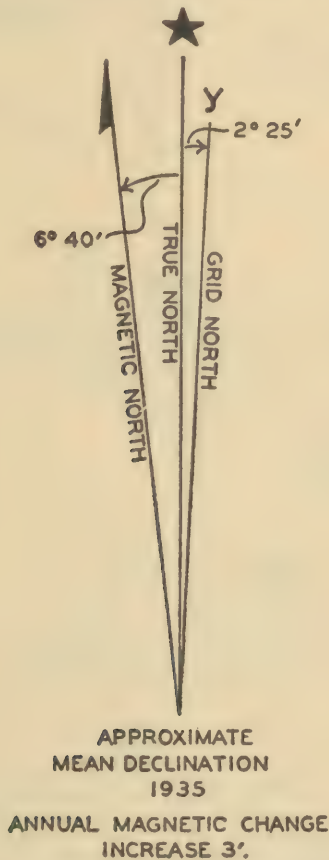


Plate 16. Map Orientation Symbol.

grid azimuth by the amount determined. If outside (left), it will be greater than the grid azimuth. Plate 17 shows a diagrammatic method of determining the grid-magnetic adjustment for three separate instances.

ELEVATION AND RELIEF

Relief. Relief, or topography, are terms used to designate the vertical irregularities of the ground, such as the hills, ridges, valleys, and depressions. The presence or absence of such terrain features, and their location, size, and arrangement are very essential items of military information because they greatly affect the disposition of troops and the tactical plans of the commanders. Therefore, a military map must show the relief of the area, and a commander must be able to secure this information from his map. Since the map itself is flat, special devices are necessary to show relief. One system is to color the high ground with various shadings of color to indicate different *layers* of elevation.

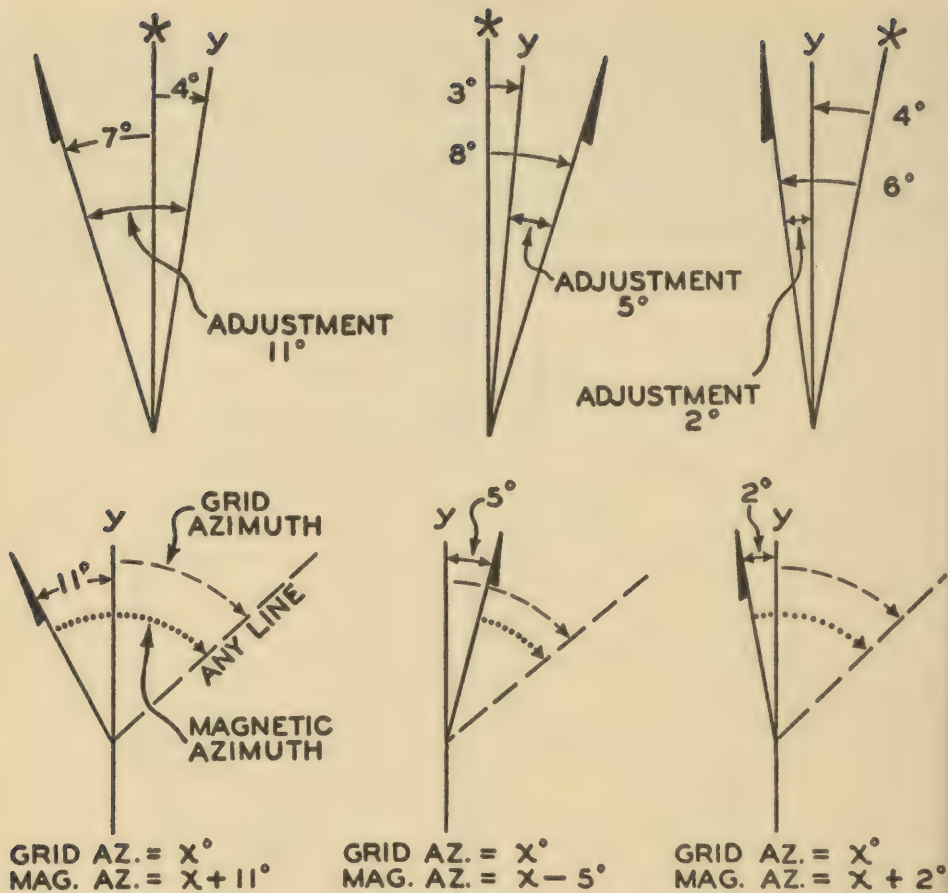


Plate 17. Determining the Grid-Magnetic Adjustment.
(Angles exaggerated)

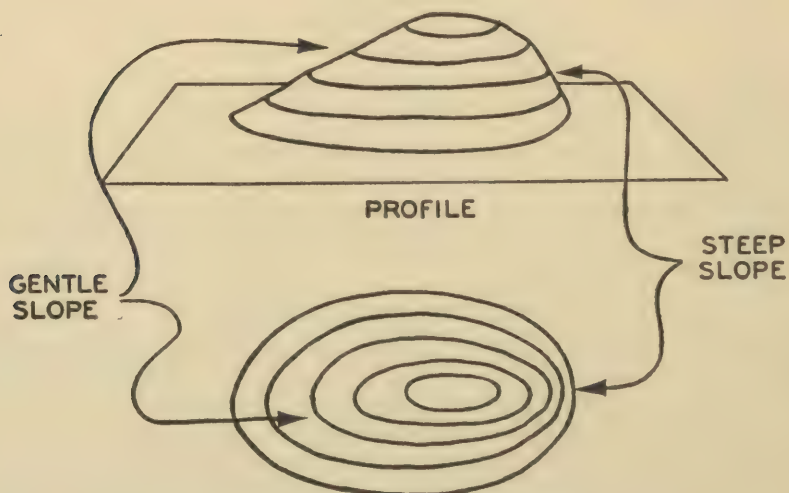


Plate 18. Contour Arrangement.

This system is used on the air navigation maps, and on some small scale maps. Another system is to use *hatchures* or small fine lines to *picture* the ridges and hills. Neither gives reliable elevation data for specific points on the terrain. The system now used on all our standard topographic maps is the contour system.

Contours. Contours are a map device for depicting the relief of an area by means of lines drawn on the map. Each contour line represents a given elevation or is a line joining all points of the same elevation. The elevation that each contour represents is shown thereon (sometimes on every fifth contour only), the elevations being based on mean sea level. The seashore line itself would be the base contour line. Thereafter there would be a separate contour for each successive gain of elevation of 10 feet or of 20 feet, depending on the scale of the map and the contour interval (vertical interval or VI)

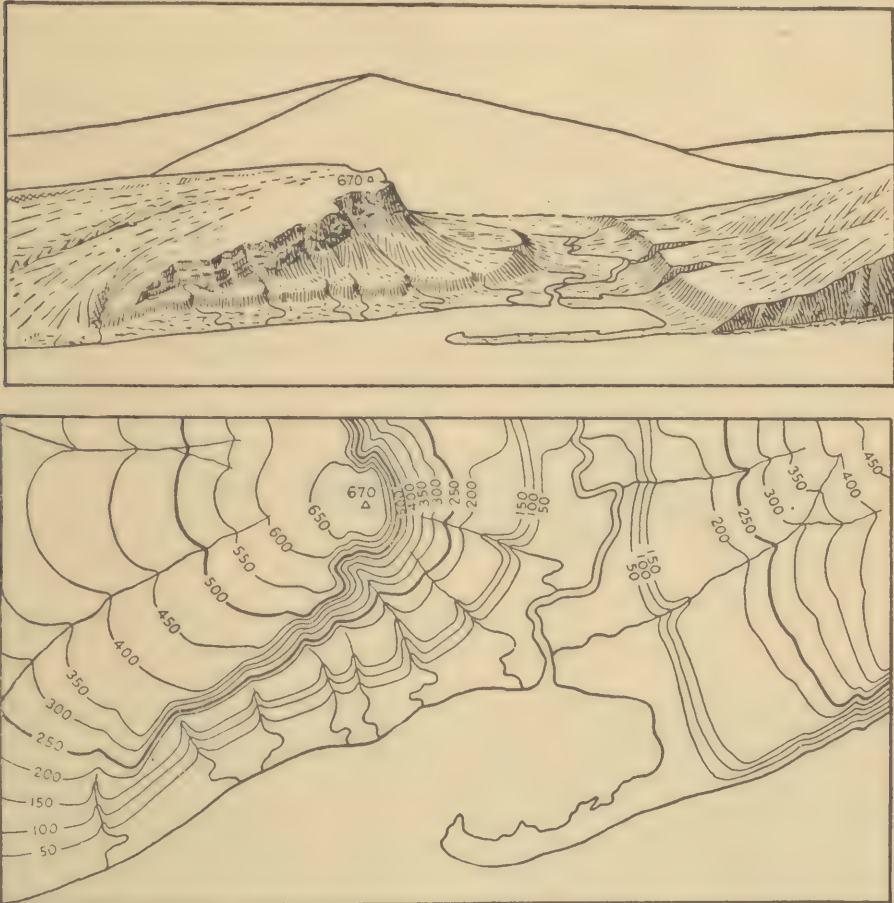


Plate 19. Contours of Ground Forms.

The top figure is a sketch of the ground.

The bottom figure shows how this ground would be indicated on a contoured map.

selected. Each contour follows the line that would be the new shore line if the water level were raised to its particular elevation.

The following are some of the characteristics of contours:

- a. A contour cannot begin or end. It must eventually close upon itself.
- b. A contour cannot join or cross another contour. (Exception in vertical and overhanging cliffs.)

c. All points on a contour have the same elevation, and only points on the same contour have that elevation.

d. In order to "cross" a ridge, a contour must pass around the outer end of the ridge (like a road of 0 grade passing around a hill) and in so doing it assumes a "U" trace or shape.

e. In order to "cross" a valley, a contour must follow up the valley, cross the stream, and then come back again on the opposite side, and in so doing it assumes a characteristic "V" trace or shape.

f. The steeper the slope, the closer the contours; and conversely, the gentler the slope the wider apart the contours.

g. Evenly spaced contours occur on uniform slopes. Irregularly spaced contours occur on uneven slopes.

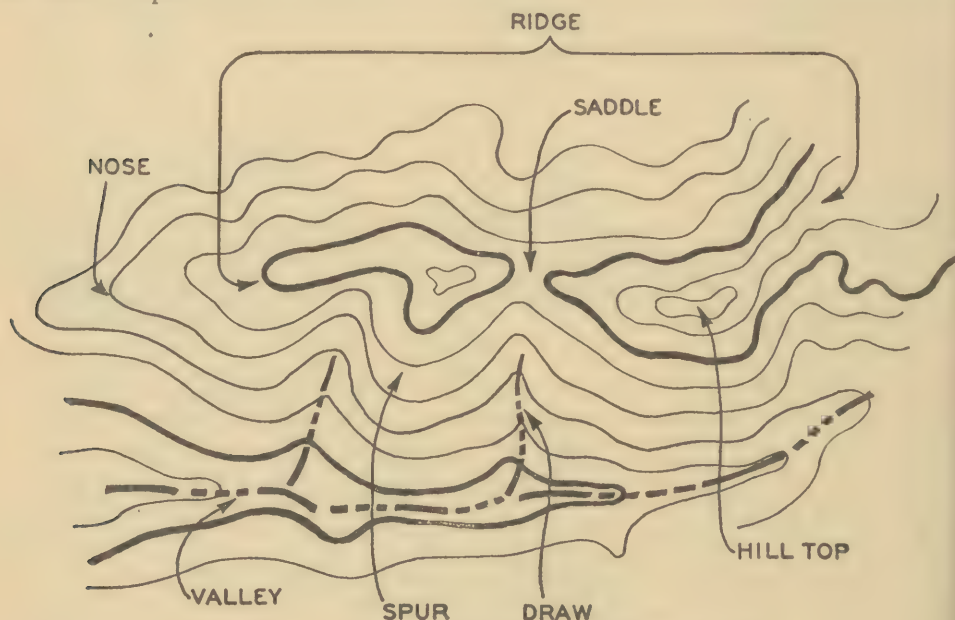


Plate 20. Contours of Characteristic Ground Forms.

h. Closed contours indicate hilltops (sometimes depressions—rare).

i. A contour always runs at right angles to the direction of the steepest slope.

j. In map reading it is presumed that the ground between two adjacent contours has a uniform slope, though this may not be true in fact.

Determining Elevation. a. *Of a point on a contour.* To determine the elevation of a point on a map that happens to fall on a contour, search along the contour line for its stated elevation. This will be the elevation of the point. On most maps every fifth contour is accentuated for convenience, and often only every fifth contour is numbered. In such cases, note the vertical interval shown on the map, the elevation of the nearest numbered contour, and the number of intervening contours, and compute the elevation of the required contour. The elevation of point A on Plate 21 is 580 feet.

b. *Of a point on a slope between contours.* To determine the elevation of a point on a slope between contours, first determine the elevation of the two contours between which the point lies. Then note the relative position of the point with respect to these two contours, and along the line of the steepest slope, which is the line perpendicular to the contours. Interpolate the distance in terms of elevation. Point B on Plate 21 is 594 feet.

c. *Of a point above the top contour.* In the case of a point falling within the top contour of a hill or ridge, only an approximation is possible. The elevation of point C on Plate 21 must be greater than 600, and must be less than 620 feet. Since the top of the hill

ness cannot be as great as 620 feet (or the 620 contour would appear), and the point "C" is obviously not at the top of the hill, its elevation would be estimated as roughly between 605 and 610 feet.

Terrain Structure. The relief of the ground is, with rare exceptions, due to water erosion, or weathering. During the course of geological ages the streams and rivers wash away portions of the earth's surface thereby forming valleys. The more resistant portions do not wash away as rapidly, and remain as hills and ridges. Through the natural working of this process the streams seek and follow the lowest ground available to them, and therefore the drainage net, as shown on the map, is the pattern of the low ground of the area. Between any two adjacent streams there will always be found a ridge or crest, its direction generally bisecting the angle between the streams, and usually centrally located. The tops of the ridges are usually irregular, the high points constituting hills or peaks,

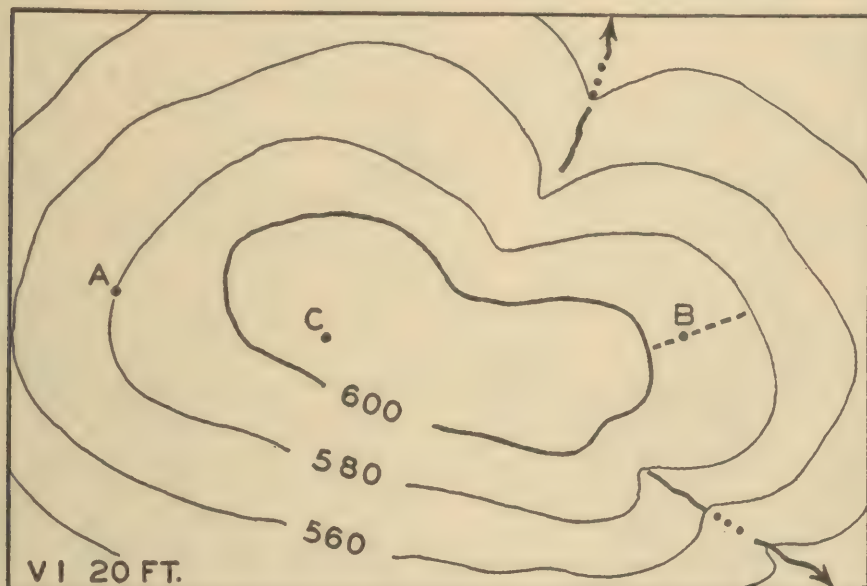


Plate 21. Determining Elevation.

and appearing on maps as a succession of closed contours. The basic terrain structure consists of a drainage system, following a characteristic pattern, and a ridge system which conforms to and complements the drainage system. The best way to study the terrain structure of an area is to trace out the drainage system, and then to trace out the ridge system. The exact location and trace of the drainage system is shown on maps by the proper stream conventional signs. The exact location and trace of the ridge system can be determined by tracing along the line established by the hills and ridges as shown by the contours.

Profiles. A valuable method of visualizing the details of relief is by profiling a selected line on the map. The profile gives a cross-section view of the terrain as it would appear on a vertical section through the line being profiled. The vertical scale is greatly exaggerated in most profiles, in order that the details of the relief can be more easily studied. Assuming the scale of the area shown in Plate 24 to be 1:10,000, the relief in the profile has a vertical exaggeration of about ten to one. To construct a profile, a working space (see Plate 23) is first constructed consisting of equally spaced horizontal lines, each line to represent the elevation of a contour, and the spaces between the lines representing the difference in elevation between two contours. The number of spaces must be sufficient to accommodate the total number of contour intervals between the lowest and the highest point involved in the profile. Lines are numbered in sequence to conform to the contour lines involved.

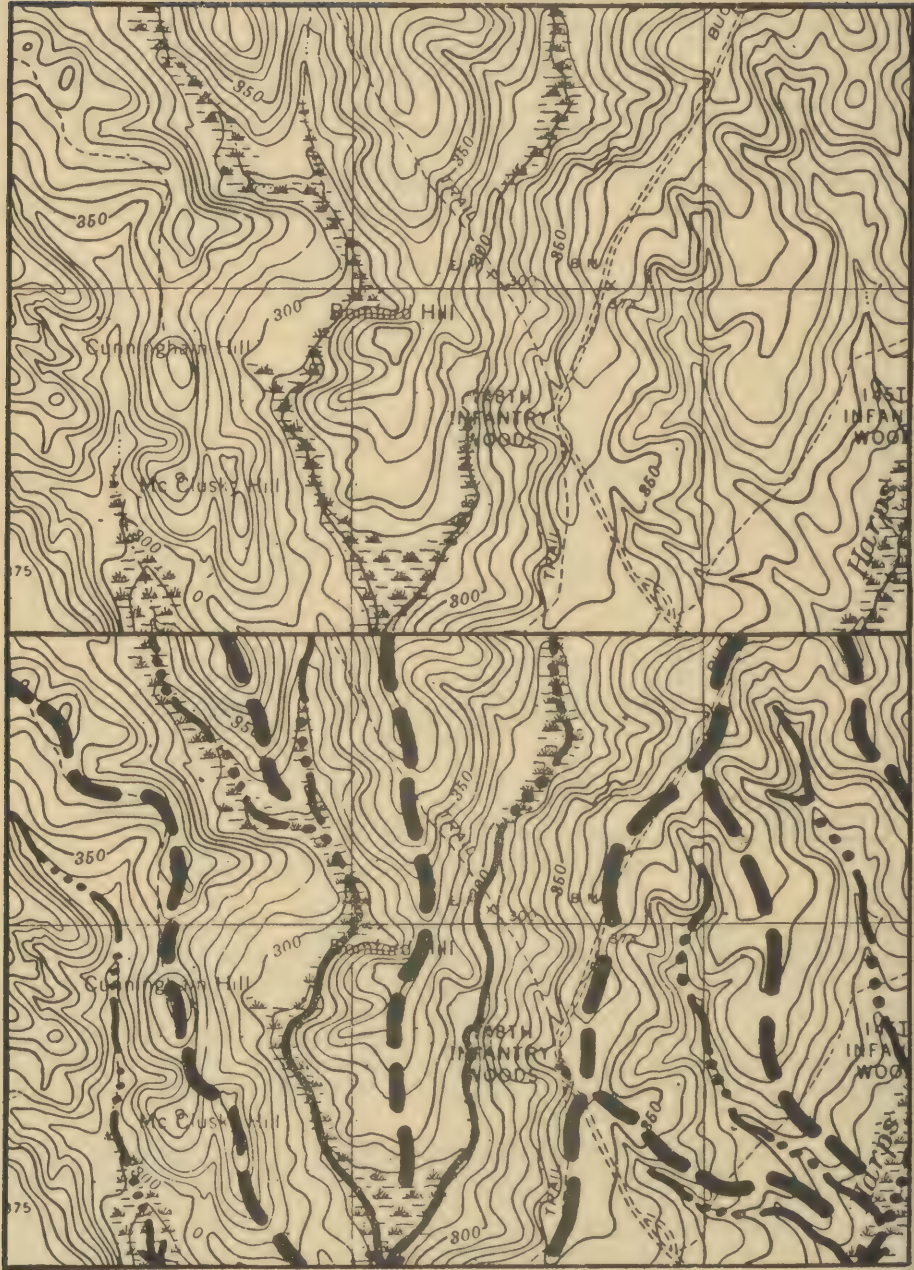


Plate 22. Basic Terrain Structure.

The working space is placed on the map, lines parallel to the line to be profiled. Perpendicular lines are dropped down into the working space from each point where the line (O-P on Plate 24) crosses a contour, a stream line, or a ridge line. This method maintains the proper horizontal spacing of these points, which is essential to the accuracy of the profile. The contour crossing points are plotted on their appropriate elevation lines of the work space. The elevations of the stream and the ridge crossing points are determined by interpolation and plotted accordingly. In Plate 24 they are (reading from O to P) $\frac{1}{2}$ (at O), $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{3}$ and $\frac{1}{2}$ of a contour interval, respectively.

The profile is completed by connecting, by straight lines, the points thus plotted.

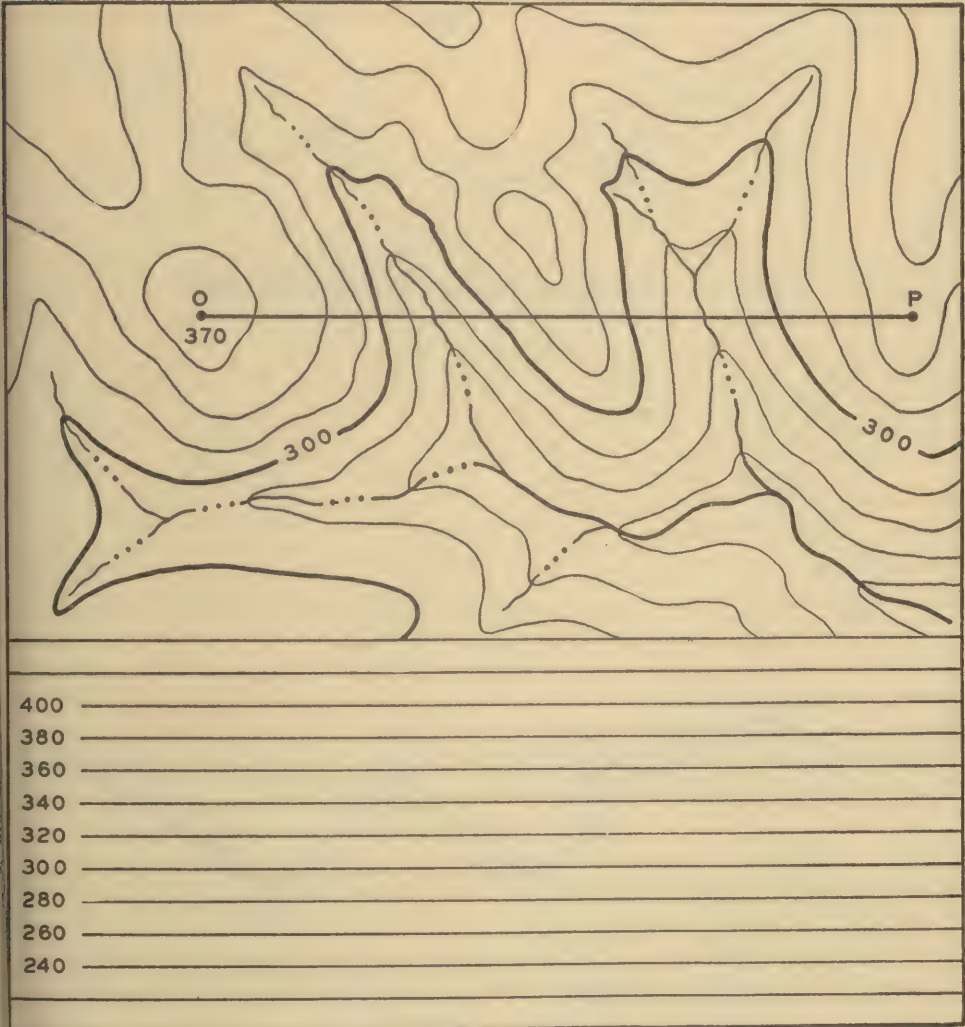


Plate 23. Profile Working Space.

Visibility. *a. By profile.* Reliable knowledge of the visibility, or lack of visibility of points or areas is very essential to commanders. It greatly affects the location of observation posts, the siting of weapons, selection of targets, and may determine the suitability of combat positions. The profile is the most reliable and useful means of determining visibility, because it gives accurate information of what points are and are not visible, the location and the extent of invisible (*defiladed* or *dead*) areas, and from it the

actual amount of vertical defilade can be computed for any point. On Plate 24, assume an observer to be standing at O, eyes five feet above the ground, looking toward P. The profile indicates that there are two areas invisible to the observer, and their extent can be plotted back on the map from the profile. The amount of vertical defilade at the second stream can be computed in terms of the vertical intervals of the working space, and found to be approximately 50 feet. The profile also shows that the nearest point to O from which the first stream can be seen (military crest of the east slope of hill O) will be at the 320 contour line (indicated on the profile by an arrow).

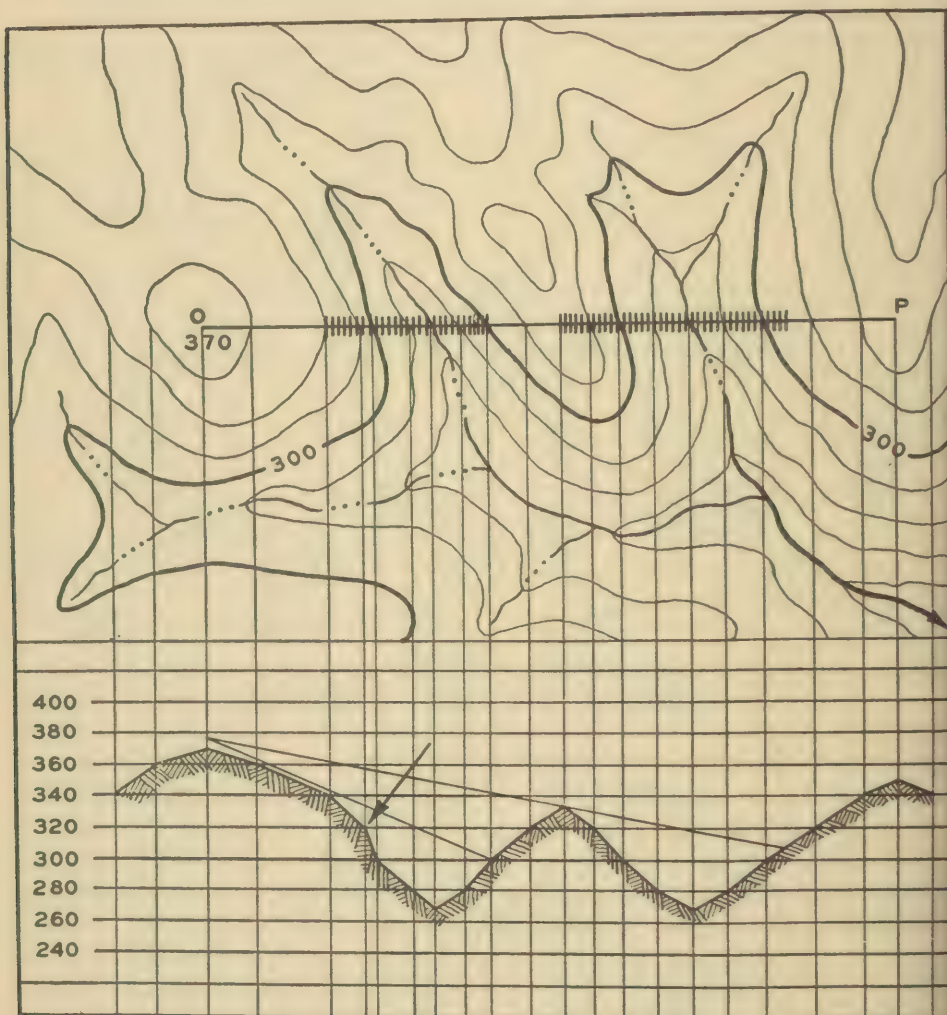


Plate 24. Profile.

The visibility of entire areas, such as the field of view from an observation post, can be plotted on a control map by profiling each of a series of radiating lines and completing the outline of the invisible portions by inspection. (See Plate 25.)

b. By hasty profile. When speed is essential, and the visibility of specific points, only, is at issue, the necessary information can be quickly determined by plotting on the working space only the points involved. Such points would be the observer, the probable masks, and the points whose visibilities are to be determined. In Plate 26, assuming the visibility

of points A and B, only, are at issue, the plotting shown is sufficient to determine that A is visible and that B is not visible from O.

c. *By computation.* The visibility of any single point can be determined*by calculation. The line of sight from an observer to any point would follow a straight line (if uninterrupted) which would be the hypotenuse of a triangle, the other sides being the distance, and the difference of elevation. These data can be determined by measurement and by calculation. The visibility of point B on Plate 26 could be determined in the following manner (see Plate 27). Measure the distance O to B and O to M in any common

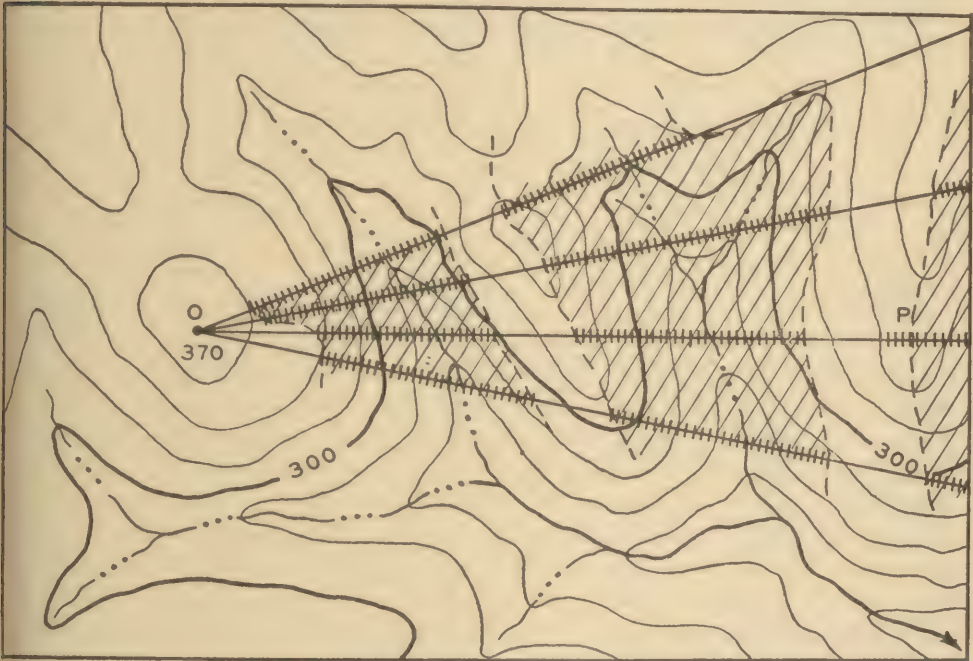


Plate 25. Visibility of Areas.

unit of measurement (in this case the measurement was made in inches). Determine the difference in elevation between O and B. Stated in simple terms we now know that the line of sight has dropped 87 feet in 3.40 inches of map distance. We can easily determine how much this line of sight will drop in the 2.24 inches of distance from O to the mask, by applying the law of similar triangles:

$$\begin{aligned} 3.40 : 2.24 &= 87 : X \\ X &= 57.3 \end{aligned}$$

Therefore, the line of sight from O to B will have dropped 57 feet by the time it reaches the mask, and will have a theoretical elevation of $(375 - 57)$ 318 feet. The actual elevation of the mask as shown by the contours is about 332 feet. Therefore, the mask is too high (by 14 feet) to permit observation from O to B.

d. *By inspection.* Most visibility problems can be solved by inspection. If the intervening mask is higher than both the observer and the point, then there can be no visibility. If it is lower than both the observer and the point, then obviously the point can be seen. The line of theoretical sight, being a straight line, will drop (or rise) one-half the total drop (or rise) in half the distance, one-third in one-third of the distance, three-quarters in three-quarters of the distance, etc. Therefore, by noting the amounts of the differences in elevation of O-P and O-M, and comparing their relation with the relative location of the mask between O and P, one can by inspection classify visibility cases as *visible*, *not visible*, and *doubtful*. The visibility of the *doubtful* cases must be determined by one of the methods described above. Plate 28 shows a case of a mask approximately

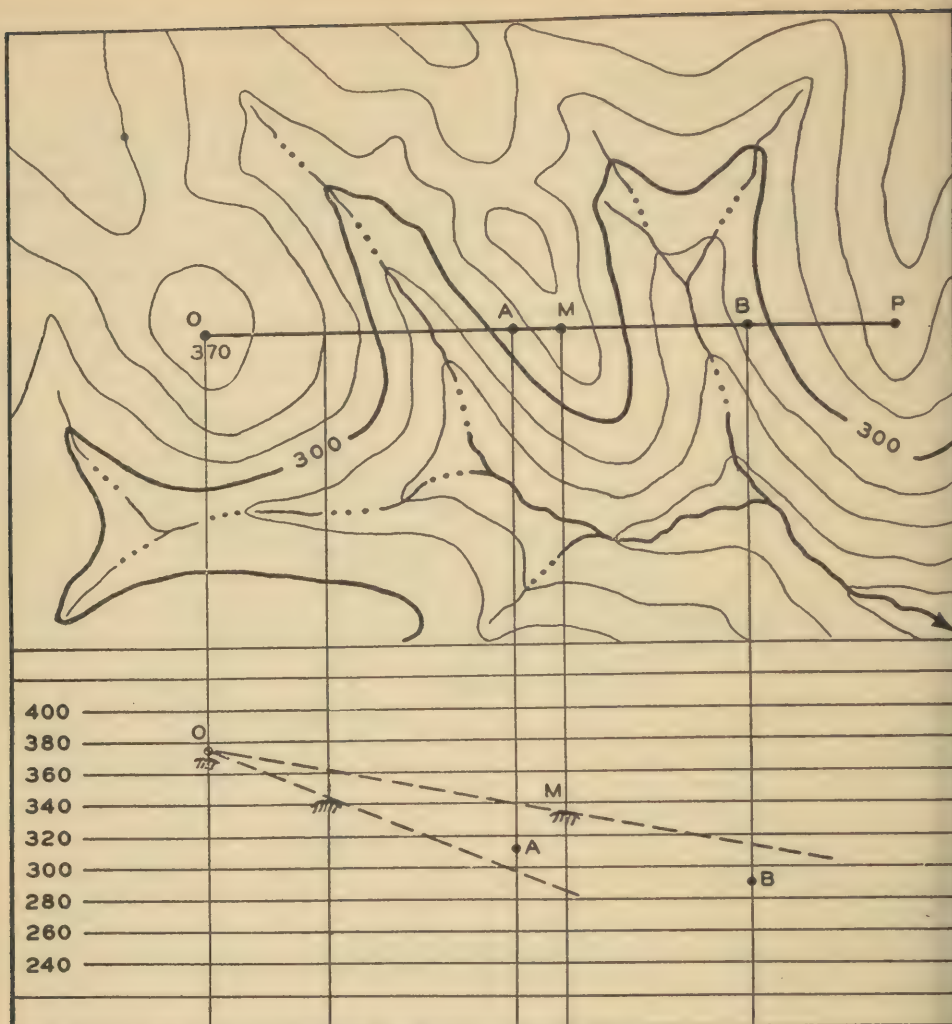
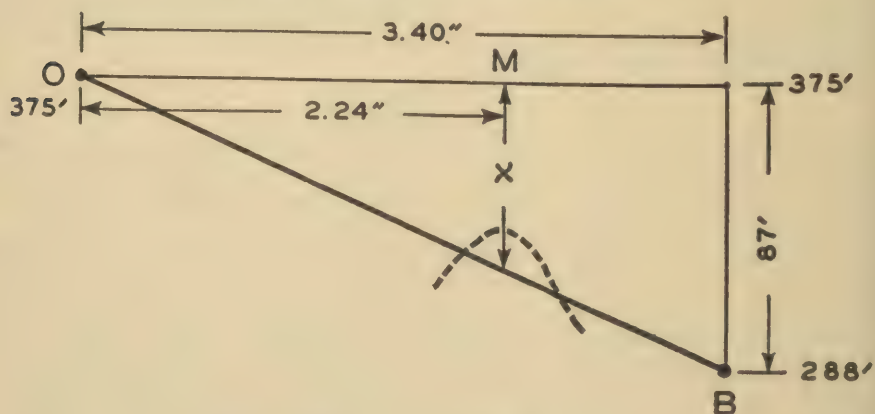


Plate 26. Visibility by Hasty Profile.



$$3.40 : 2.24 = 87 : X$$

$$X = 57$$

Plate 27. Visibility by Computation.

one-half the height of the difference of elevations O and P. It shows that only when such a mask is located approximately half way between O and P, would there be any doubt as to the visibility of P.

MAP READING IN THE FIELD

General. The map is the only means available for studying distant or inaccessible terrain. Even when the terrain is accessible, the map is still most valuable as a source of names, and a convenient means by which to find one's way about. The officer should always take his map with him into the field, and refer to it constantly. When operating over unfamiliar territory he should keep his movements plotted on his map, verify his location at every opportunity, and from his map learn the names of the terrain features encountered.

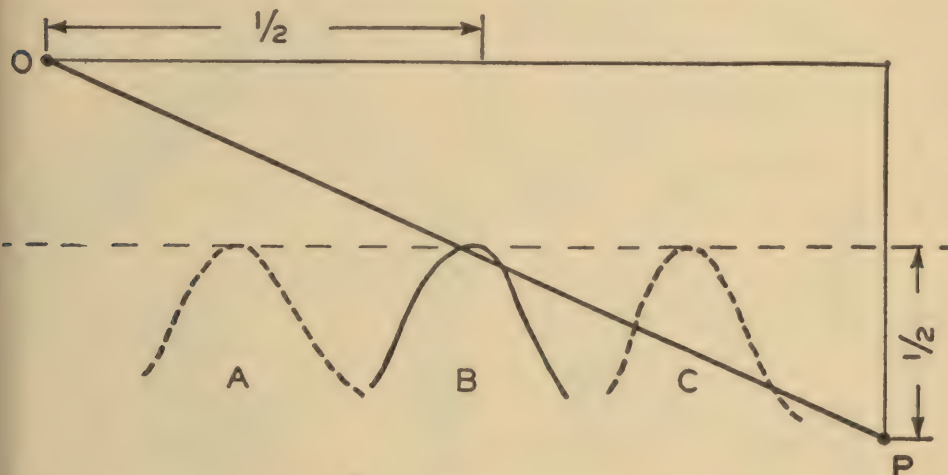
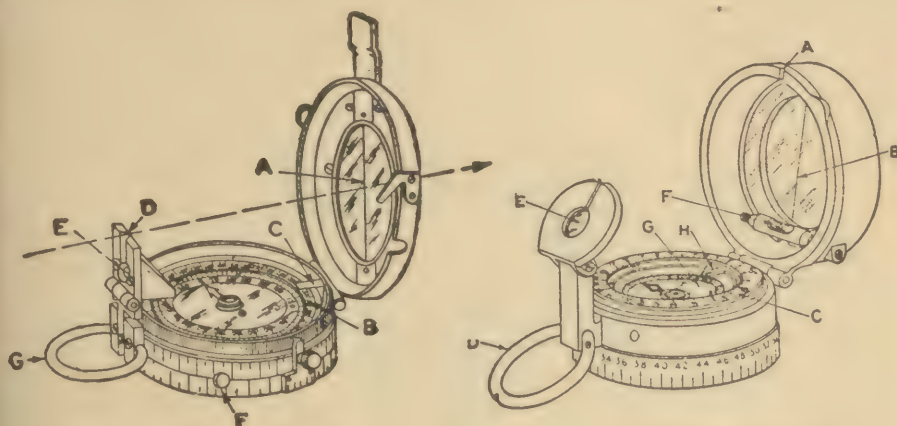


Plate 28. Visibility by Inspection.

Terrain Feature Terms. The standard terrain terms, such as hill, ridge, stream, crest, and the like, are used in map work and in the field. For use in the field to identify more readily the special and the minor terrain features, a large number of less common terms are used. Those most frequently encountered are shown in Plate 29.

Distance. The determination of distance in the field presents many difficulties. Distance can be measured by pacing or by tape, but this method is slow, tedious, and often impracticable. Long road distances can be measured by the odometer of an automobile. Visible areas can be measured by estimation by eye. This requires a certain amount of skill and experience, and is not successful in the dark, in woods, over long distances, or in broken country. Two other methods of handling distance in the field are the landmark method, and the travel-time method. For example, a patrol is directed to proceed two miles down a road and take up a position in observation. The patrol leader could take a map, scale off two miles, study the map and select some recognizable feature in that vicinity. He would then march until he reached the feature. On the other hand, if no map were available, he might calculate that the two miles would require forty minutes of marching. He would march forty minutes and then take position.

The Compass. Direction in the field is measured with the compass. There are two types of hand compass issued in the service, known as the *prismatic* compass and the *lensatic* compass. They are shown in Plate 30 and are similar in design, construction, and employment. Each compass consists of a case containing a magnetic dial balanced on a jeweled pivot, a hinged cover with a glass window, an eye piece containing a prism or a lens for reading the finer graduations of the dial, and a holding ring. The glass cover has an etched line which is used like a front sight, and the eye piece has a slot which can be used as a rear sight. The dial is fixed to a magnetized needle, rotates with the needle, and is graduated for a full azimuth circle. Compasses are provided graduated



The Prismatic Compass

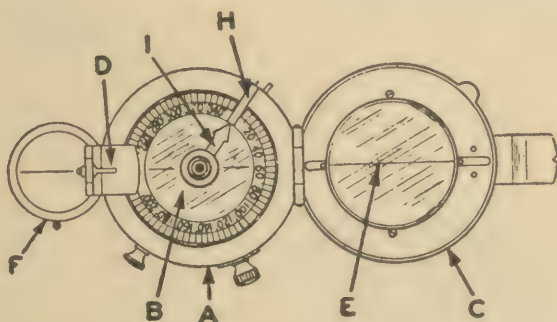
LEGEND.

- A. Front sight.
- B. Index mark on case.
- C. Movable index on crystal (luminous).
- D. Rear sight.
- E. Prism mounting.
- F. Clamp for compass card.
- G. Holding ring.

The Lensatic Compass

- A. Cover.
- B. Front sight.
- C. Index markings on case.
- D. Holding ring.
- E. Lens.
- F. Level.
- G. Compass card or dial.
- H. Xylonite indicator.

Plate 30. Types of Military Compasses.



- A. Case.
- B. Compass card or dial.
- C. Cover.
- D. Rear sight
- E. Front Sight.
- F. Holding ring.
- H. Movable index on crystal (luminous)
- I. Dial needle.

Plate 31. The Prismatic Compass Open.

in degrees, in mils, and in both. There is an index mark inside the body of the compass near the hinge at which point azimuth readings of the dial are made. The cover can be used upright for taking field azimuths, or opened flat for use on the map. The dial is locked by closing the cover, and must be unlocked manually after the cover is opened. The line passing through the slot in the eye piece, the center of the dial, the index mark, and the hair line of the cover is known as the *axis* of the compass. The compass needle



Plate 32. Using the Compass in the Field.

is affected by the presence of iron, steel, or electricity, and will not give accurate readings near an automobile, tank, field piece, machine gun, or power line. A steel helmet, rifle or pistol on the person of the observer may influence the needle and make readings inaccurate.

Measuring Azimuth With the Compass. To read the azimuth of a point on the terrain (distant hill, house, etc.) proceed as follows: Raise the cover and the eyepiece and unlock the dial. Hold the compass to the eye and sight the compass at the object. Hold

**LUMINOUS MARK SET BY
THE NIGHT MARCHING SCALE.**

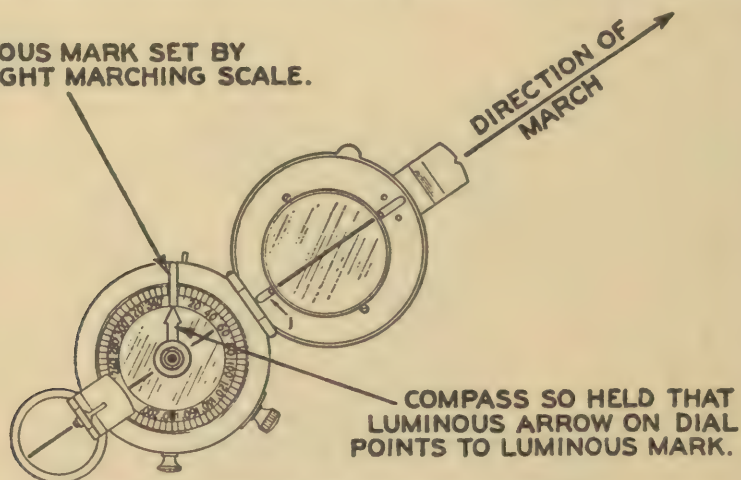


Plate 33. Compass Set for Night Marching.

the compass steady until the dial comes to rest. Read the azimuth figure on the dial at the index point. This will be the magnetic azimuth of the line from the observer to the object. See Plate 32. To establish a given azimuth on the ground, proceed as follows: Raise the cover and lens and unlock the dial. Permit the dial to come to rest. Hold the compass to the eye and watch the dial, facing the entire body about until the desired azimuth figure on the dial is at the index point. Holding the compass in this position



Plate 34. Orienting the Map by Compass.

look through the *sights* of the compass and pick up some ground feature on the line of sight. The line determined by this feature will be the azimuth desired.

Marching by Compass. *a. By day.* Orders to troops may direct them to attack cross-country in a prescribed direction given in terms of azimuth. Groups or individuals selecting cross-country routes from the map may compute the azimuth of various legs of the trip to prevent the possibility of getting lost. In any such case, map azimuths must be converted to magnetic azimuths before they can be used with the compass. To march by compass, the commander rotates the compass until the dial reads the required azimuth. He then sights along the axis of the compass and selects some hill, house, tree, or other feature on this line. He then marches toward the above feature until he reaches it, or it becomes invisible. He then repeats the operation, selecting a new feature on the line of the required azimuth upon which to guide the march. This is continued until the goal is reached (the compass is not in use while actually marching). The compass is used to select successive features on the required line, and the actual marching is always conducted toward such visible features. The more distant and prominent the feature the easier the procedure.

b. By night. For use in marching at night, the compass is equipped with a movable luminous marker on the top of the case, and with a night-marching azimuth scale on the outside of the case near the base. To set the compass for night marching on a predetermined azimuth, rotate the ring on the top of the case until the luminous mark is at the proper azimuth on the night-marching scale. Hold the compass in the hand with the dial free and turn the entire body until the luminous arrow of the dial points to the luminous marker. The direction of march is now the line of the axis of the compass. Select some features such as a low star, skyline hilltop or saddle, or other recognizable feature on this line and march in the direction of the feature selected. Repeat the operation as often as necessary and make frequent checks of the direction while en route. The setting of the night-marching mark on its correct azimuth must be done before going into the field, or by flashlight screened from enemy ground and aerial observation by an overcoat, shelter half, or other means.

Orientation in the Field. Whenever the map is studied in the field, it should be oriented to the ground. A map is "oriented" when the directions on the map are parallel to the corresponding directions on the ground. If any one direction on the map can be made parallel to its corresponding ground direction, all other directions will automatically become parallel to their corresponding ground directions also, and the map will be oriented. An individual in the field is said to be "oriented" when he knows his location, both in the field and on the map, and also knows the cardinal directions on the ground.

Orienting the Map in the Field. *a. By compass.* In unfamiliar territory, when the individual is not sure of his location, and when accuracy of orientation is desired, the fastest and best method of orientation is by compass. Place the map on a level surface. Place the compass, opened and with the dial free, upon the map so that the axis of the compass (etched line on the glass cover) is accurately superimposed on and in coincidence with a vertical grid line of the map. The cover of the compass must be toward the top of the map. Revolve the map and compass together until the needle is in the same relation to the grid line as is shown for the magnetic north arrow in the orientation symbol on the map. (See Plate 34.)

b. By inspection. When traveling by road, and when the reader knows his approximate location on the map, the map may be oriented as follows: Lay the map in the road. Rotate the map until the road as shown on the map is pointing down (is parallel to) the road itself. Any trail, stream, ridge, or other line identifiable on both the map and the ground can be used in the same manner.

c. By ground feature. An individual in the field who knows his location, but who may not have a compass available, and who does not know the cardinal ground directions, can orient the map as follows: Study the ground and the map and select some distant feature recognizable both on the map and on the ground. On the map draw a line from the known map position to the above feature. Revolve the map until the line so drawn points toward the feature itself. The map will then be oriented. Sighting is facilitated by laying an alidade, straight edge, or pencil on the line.



Plate 35. Orienting the Map by Inspection.

Locating Oneself on the Map. a. By inspection. When an individual knows his approximate location on the map, he studies the visible terrain for distinctive features, and the map to locate and identify these features. He estimates the distance and direction to the features on the ground and notes the corresponding distances and directions on the map. Location by inspection is greatly simplified if the map is oriented to the ground.

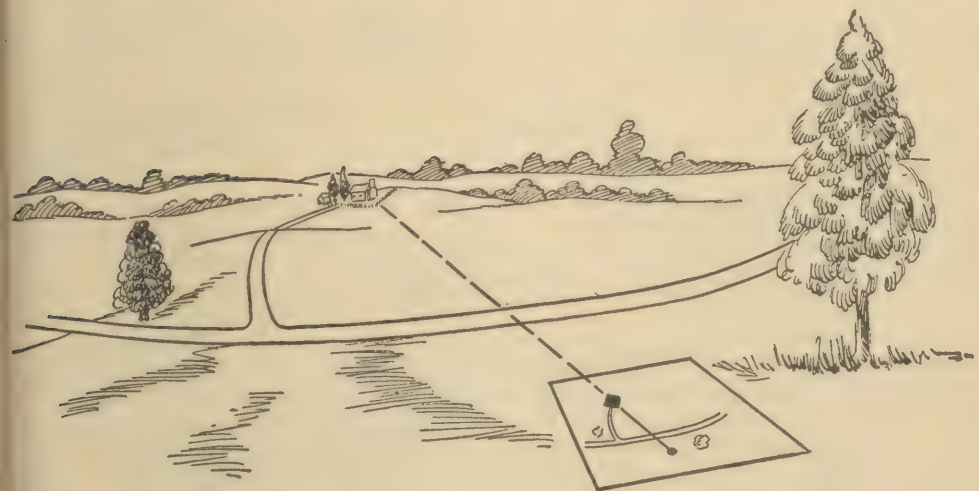


Plate 36. Orienting Map by Ground Feature.

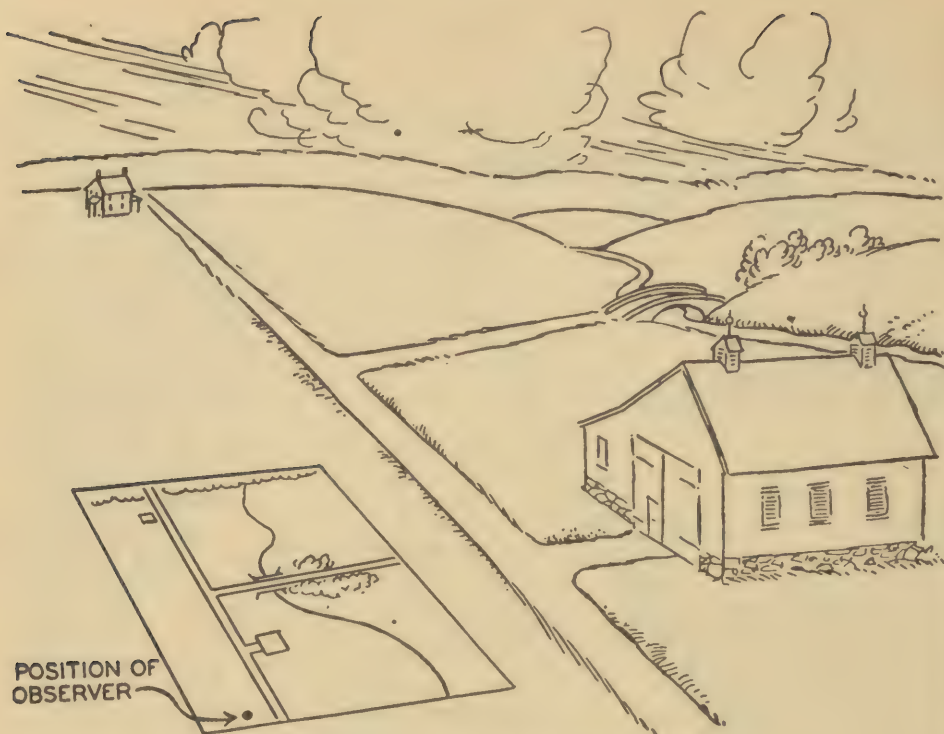


Plate 37. Locating Position on the Map by Inspection.

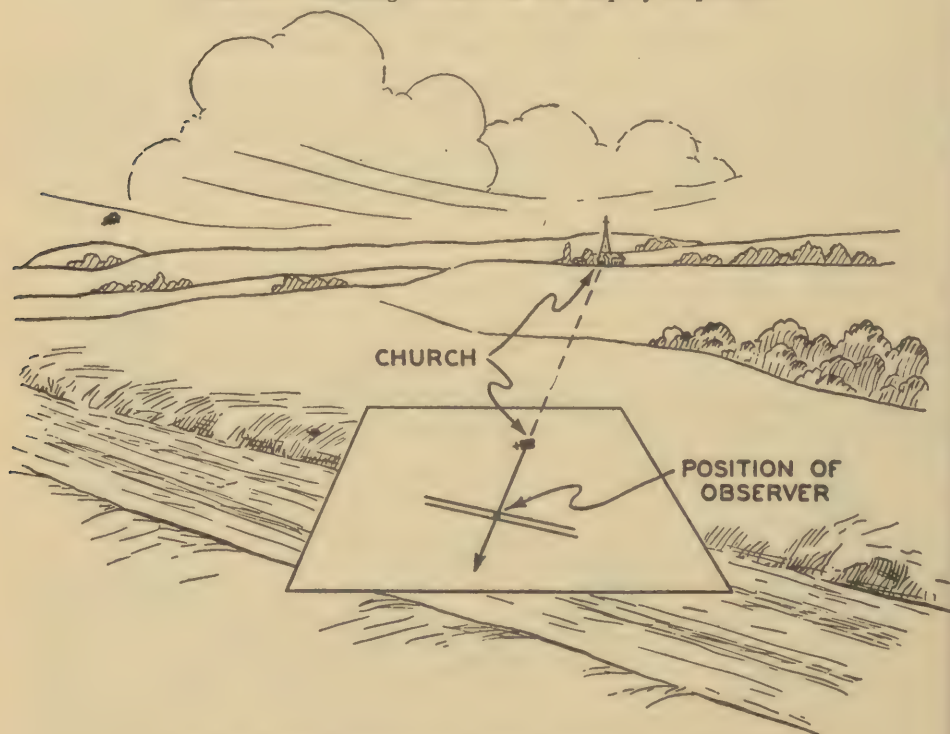


Plate 38. Locating Position on the Map by Single Point.

b. By single point. To locate one's position on the map while traveling a known road, proceed as follows: Orient the map. Select some distant feature of the terrain that can be located and identified on the map. Place a pin through the feature on the map. Take an alidade, pencil, or any straight edge, hold it against the pin and turn it until it points at the feature on the ground. Draw a line on the map along the edge from the pin toward the road. The point where this line intersects the road is the location of the position. Check the results by studying the near-by terrain features and comparing them with the map.

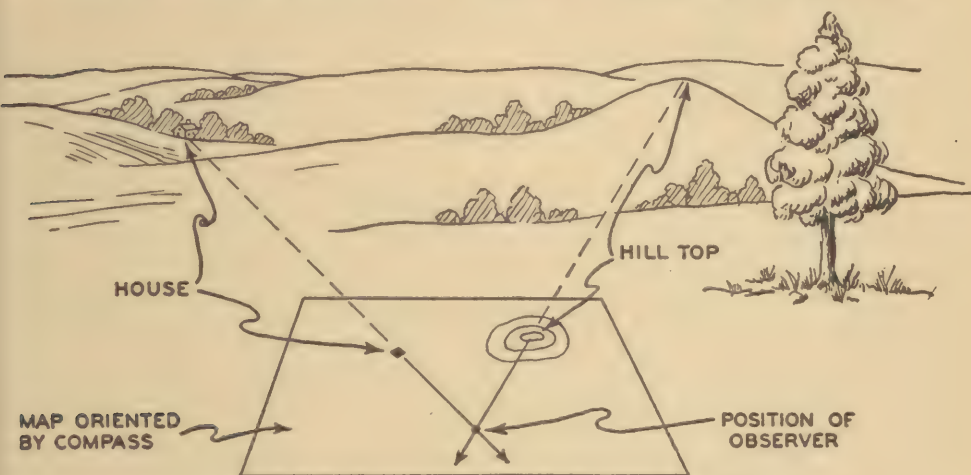


Plate 39. Locating Position on the Map by Resection.

c. By resection. To locate one's position on a map in the field by resection proceed as follows: Orient the map accurately. Select a distant visible feature of the ground, and locate and identify it on the map. Place a pin in the feature, place an alidade or any straight edge against the pin, and turn it until it points at the feature on the ground. Draw a ray on the map from the pin toward your position. Select a second feature, at as nearly a right angle as possible from the first feature. Repeat the operation. The intersection of the two lines is the desired map location. During the entire procedure the map must remain oriented.

Identifying Features in the Field. Features, such as hills and woods, are shown on the map in their horizontal plan. In the field, one sees these features in profile instead of in plan, and their characteristic sizes and shapes may not be apparent. An officer directed to proceed to "SMITH HILL" may see several hills to his front, all of similar appearance, and be in doubt as to which one is "SMITH HILL." Or again, an officer in the field in unfamiliar territory may wish to report some activity noticed in one of several clumps of woods of indefinite and indistinguishable identity. The map is a source of names and therefore of identification. The use of the map for this purpose is one of its most important military uses in the field.

a. To identify on the ground a feature shown on the map. Orient the map. Locate own position on the map and place a pin in this position. Locate the feature on the map and place another pin in its position. Lay a straight-edge against both pins and sight along the straight-edge. The ground feature will lie on this line of sight, and at the distance indicated by the map.

b. To locate or to identify on the map a feature seen on the ground. Single ray method. Orient the map. Locate own position on the map and place a pin in this position. Lay a straight-edge against the pin and sight the straight-edge at the ground feature, keeping the straight-edge in contact with the position pin. Draw a ray (line) on the map on the pin side of the straight-edge. Estimate the ground distance to the feature, and scale this distance off along the ray. This point will be the map location of the feature.

c. To locate on the map a feature seen on the ground. Intersection method. Orient the

map. Locate own position thereon, and place a pin in this position. Lay a straight-edge against the pin and sight the straight-edge at the ground feature. Draw a line on the pin side of the straight-edge. Proceed to some other location from which the feature is visible, and repeat the operation from this point. The intersection of the two lines will be the map location of the feature.

CHAPTER X

INTERPRETATION OF AERIAL PHOTOGRAPHS

USES OF THE AERIAL PHOTOGRAPH

Introduction. Aerial photographs are very useful military instruments. They were first used extensively during the World War, it being estimated that the American forces alone during the first four days of the Meuse-Argonne offensive produced and used more than 56,000 prints. Since that time there has been improvement in equipment and in technique, and at the present time our air force is well able to perform extensive photographic missions. Commanders in the field may reasonably expect to be provided with ample aerial photographs in the future.

Uses of the Aerial Photograph. a. Intelligence. During a campaign the enemy positions and rear areas are photographed and the photographs carefully studied for indications of his organization, and for possible artillery and bombing targets such as supply points, assembly areas, command posts, and artillery positions. These features may sometimes be recognized directly from the photograph through their appearance. More often their appearance is carefully disguised, and their presence and identity must be deduced from miscellaneous indications such as converging paths, regularity of outline or arrangement, grass worn away or trampled down, muzzle-blast marks, and other similar clues. Important enemy areas are rephotographed from day to day and the latest photograph compared with earlier ones. Trees, bushes, and other detail on today's photograph that may appear entirely natural, may not appear at all on previous photographs of the same area, thereby disclosing their artificial nature. The comparative study of roads may show indications of abnormal traffic during the night, thus giving warning of the location of impending attacks or withdrawals. The study of the aerial photograph for the purpose of deducing enemy information is known as *interpretation*. It is a highly specialized subject requiring special experience and training, and is not the primary interest of the combat officer.

b. Map making. The aerial photograph is very valuable as a basis for the construction of maps. Ground surveying for map making purposes is slow and laborious, and is never possible in the case of territory that lies in the hands of enemy forces. The aerial camera records such features of the terrain as roads, railroads, towns, houses, streams, woods, and cultivated areas, and shows them in their proper size, shape, and relation to each other. From rectified photographs these features may be traced and maps constructed. Machines have been developed (the "multiplex" and the "aerocartograph") which work on the stereoscopic principle and by which contours may be plotted directly from overlapping aerial photographs. This use of the aerial photograph is a specialistic one, and is not the concern of the combat officer.

c. Tactical. Any commander needs detailed and reliable information concerning the terrain over which he must fight. Formerly, this information could only be obtained through personal reconnaissance and from maps. The aerial photograph gives an additional source of information regarding the terrain. Its great value in this respect is obvious in situations where personal reconnaissance is impracticable and when maps are not available. Even when maps are available, it is probable that there will have been many changes since their compilation. Old roads are often abandoned or resited, and new roads constructed, woods are cut down, and fields formerly cultivated are found grown up into brush and woods. Maps show these features as they existed at the time the data was compiled, which may have been years before. An aerial photograph, however, shows the terrain exactly as it is. The photograph is, therefore, a very valuable source of information with reference to the terrain, in that it gives reliable, up-to-the-minute information. It is in this connection that the aerial photograph is of great importance to the tactical officer.

Terms. An aerial photograph taken with the camera pointing straight down is called a *vertical*, and shows the ground in its horizontal plan similar to that shown by a map. A photograph taken with the camera pointing sideways is called an *oblique*, and shows the

ground as a landscape picture. Obliques are usually taken with the camera axis depressed about 30 degrees below the horizontal, though this is not a fixed requirement. Two or more verticals taken in succession at the same altitude and each overlapping the other may be fitted together to form a larger picture called a *mosaic*. If the mosaic follows along a single line, such as a road or a stream, it is called a *strip mosaic*. A 60 percent overlap in successive prints is desired in taking verticals for the purpose of making mosaics. This permits accurate registration, and also facilitates the use of the prints for stereoscopic study. If a mosaic is constructed by matching the details of the adjacent prints by inspection it is known as an *uncontrolled mosaic*. In mosaics of this type a certain amount of error occurs, and this error tends to become cumulative toward the outer edges of the mosaic. To construct an accurate mosaic a ground control based on ground surveys is first plotted, and the individual prints are then registered to this basic control. Such a mosaic is called a *controlled mosaic*, and its error does not exceed that of the individual print. Photographs taken by the multi-lens cameras are called *composites* since they consist of both verticals and obliques. Plate 1 shows a relative plotting of a vertical (1:10,000) and an oblique (5000 feet) for shape and area. Plate 2 shows the characteristic shape of a five-lens composite.

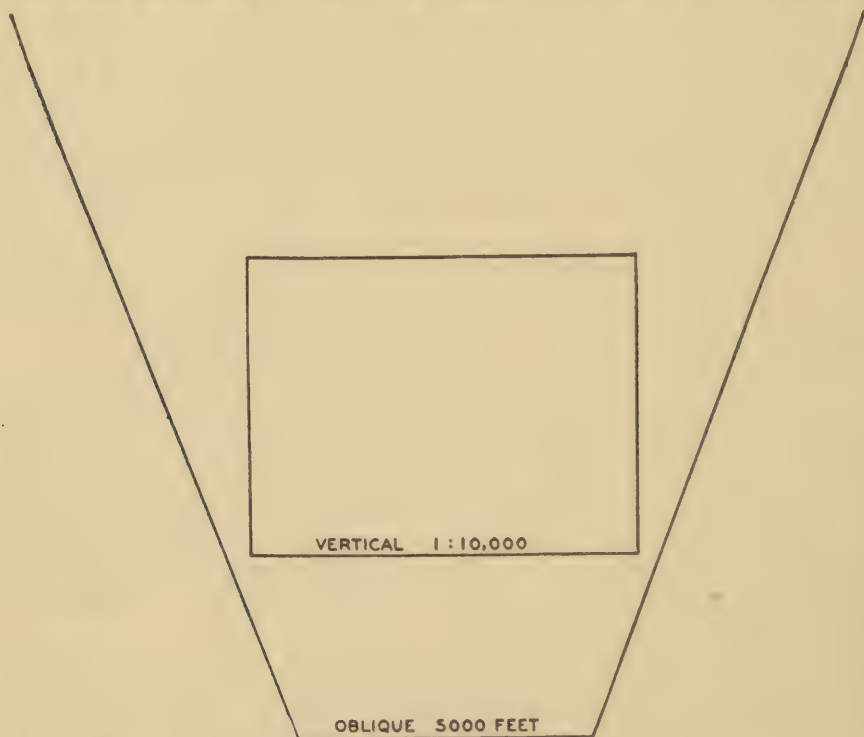


Plate 1. Comparative Plotting of a Vertical and an Oblique.

Sizes. The standard single-lens camera (K-3 type) produces a print 7" x 9". Photographic sections are equipped with laboratory equipment that is capable of producing prints up to 20" x 24" in size. Individual prints may be enlarged to this size when so desired. Also, a mosaic may be rephotographed either as a whole or in sections and reproduced in sheets 20" x 24" in size. The multi-lens cameras take pictures of other sizes. They are used primarily for mapping projects and it is seldom that the line officer will encounter them in their original print form. The amount of ground area shown in any individual print depends on the type of camera used (focal length) and the altitude from which the picture was taken. Plates I, II, and III are vertical photographs of the same area made from different altitudes and over a period of years. (*Note.* Plates referred to in Roman numerals, numbered serially from I to XII, are *photographic plates* and are to be found in

this section. They should not be confused with the plates with Arabic numbers.) The relative area of ground included in each photograph is shown by the plotting on the map in Plate 15. Study carefully the relation of the altitude upon the recorded area in each case, and also the relation of the altitude upon the amount and clarity of the minor detail recorded.

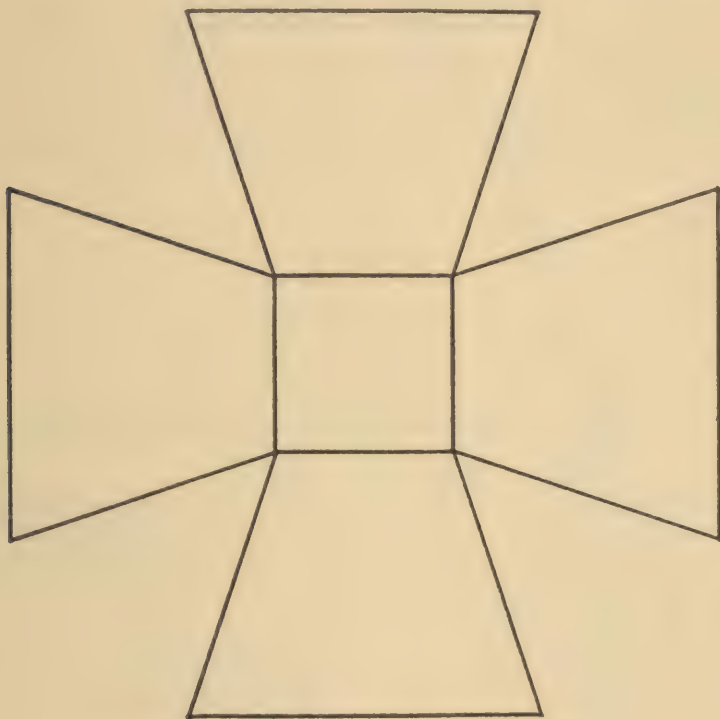


Plate 2. Five-lens Composite (rectified).

Distortion. a. Tilt. A true vertical photograph of a flat surface will show all features thereon in their proper relation as to size, shape, spacing, and direction. Should the axis of the camera be tilted from the perpendicular at the time the picture is taken the result tends toward an oblique. In such circumstances the ground shown at one edge of the photograph is farther from the camera than that at the other edge, and therefore the detail shown registers smaller. Thus, a scale used in connection with one edge of the photograph would not be true for the other edge, and for this reason it is said to have distortion due to tilt. The tilt in the average vertical produced by our air service, however, is so negligible that distortion due to tilt can be disregarded as having no effect upon the tactical use of the photograph. The plotting of Plate I upon the plot map of Plate 15 shows such a distortion, and it is about the maximum distortion likely to be encountered.

b. Relief. Where the ground being photographed is extremely rugged, the higher portions are nearer to the camera and for this reason will be recorded slightly larger than their proper relative size. Also, the tops of any high points will be displaced outward from and the low points displaced inward toward the center of the photograph. Such distortion, however, is practically unmeasurable on average terrain photographed from 10,000 feet or higher, and can be disregarded for our purposes. In photographing average terrain the distortion due either to tilt or to relief will never be sufficient to cause the reader to get an incorrect conception of the nature of the terrain, or of its individual features.

Plate 3 demonstrates the manner in which relief causes distortion. The plate shows an imaginary, huge vertical cylinder toward one side of the area. The camera would

show the top of the cylinder to be relatively larger than its base (because it is closer to the lens), and also would show the top to be displaced outward because of parallax. This illustration contains great exaggeration. The small vertical line toward the left of the diagram is drawn to scale (.034 inches) and represents the relative height of

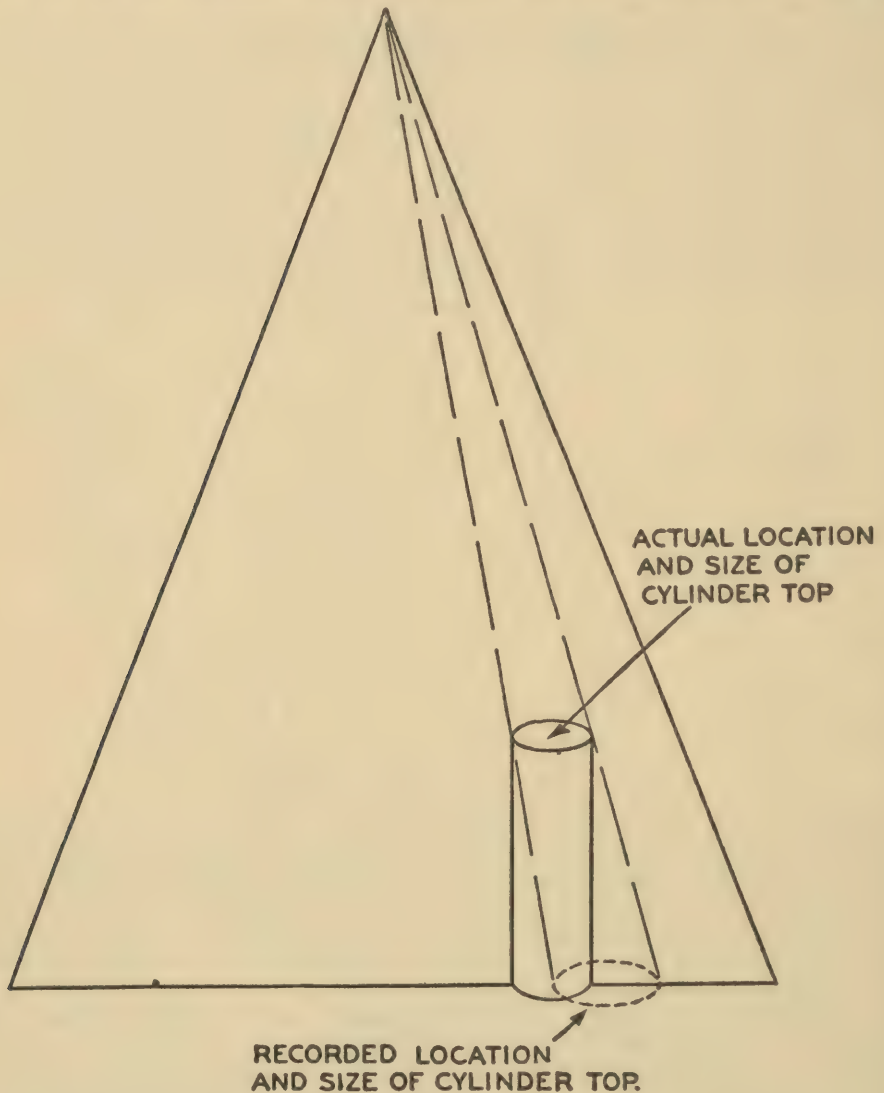


Plate 3. Distortion Due to Relief.

a 100 foot hill on a 1:15,000 vertical. The displacement of the top of this line could scarcely be detected and would approximate the average displacement encountered in verticals of this nature.

THE RECOGNITION OF FEATURES

Orientation. *a. Map.* When the photograph is being used in conjunction with a map the photograph should be oriented to the map. Maps are constructed with the north of the map at the top, and all the lettering and figures are entered on this basis. Photographs, on the other hand, are not necessarily taken on a north-south axis and the original prints do not show any lettering for orientation. Therefore, it may be necessary to study

the photograph from all angles to find some feature by which its location on the map may be determined. Once its general map location has been determined, the photograph should be placed so that its features are oriented to the map features.

b. Shadow orientation. Ground shadows recorded on aerial photographs are of tremendous importance in their effect upon the manner in which the mind of the reader interprets appearance. Plate III has especially fine shadow values that cause the relief of the area to stand out clearly. The finger-type drainage lines in the lower center with their pronounced valleys and separating dome-shaped spurs are very apparent, as are also the two clearcut gully-type drainage lines at the left of the photograph. Face toward the light and invert this photograph so that you are looking at it upside down. From this position the relief will appear to have reversed, the former valleys now appearing as encircling ridges, and the former spur ridge now appearing as an amphitheatre. The gully-type

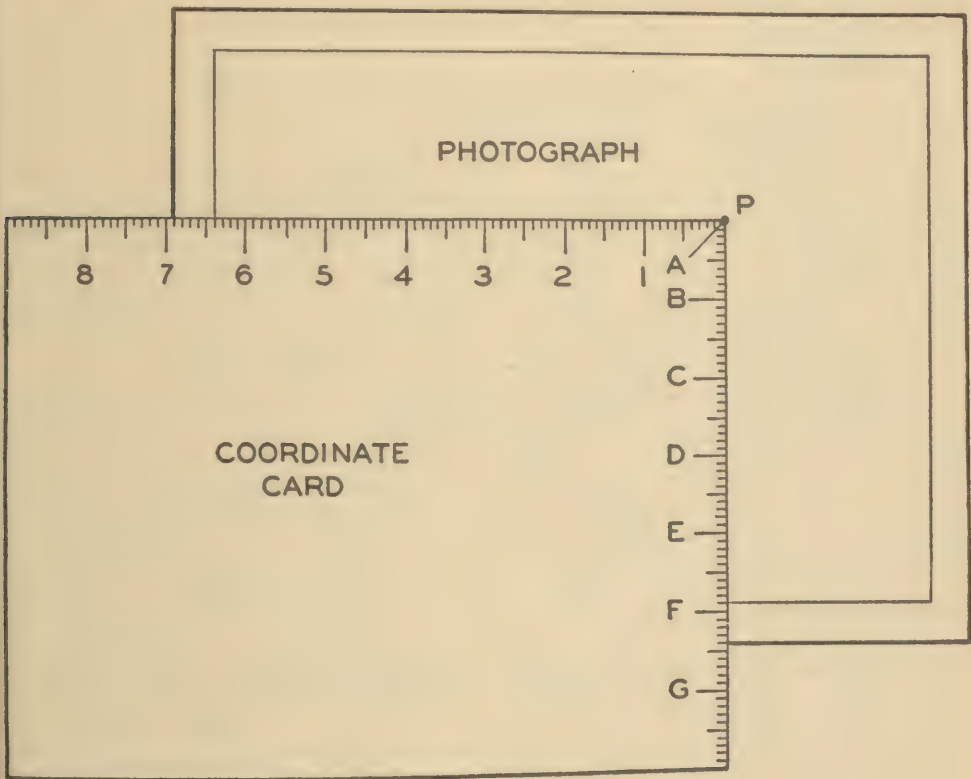


Plate 4. Using the Photo Coordinate Card.
(The coordinates of "P" are (6.4-E.9))

drainage lines, now on the right, will appear *extruded*; and even the woods will have an unnatural pockmarked, crater-like appearance. Nothing has changed in the photograph itself. If there is any change it is in the mind of the reader. It is a form of optical illusion. Nevertheless, it exists, and must be given full consideration. For this reason it is necessary that a photograph be correctly oriented for light when it is being studied for the recognition of minor detail, especially relief detail. It is correctly oriented when the shadows on the photograph fall *toward* the reader. It is best to face toward the source of the light so that the light falling on the face of the photograph coincides with the direction of light as it fell on the ground. The direction of light can be determined from the shadows of buildings, lone trees, or the edges of woods. All the photographs in this text have been oriented for shadow, which, unfortunately, causes them to be upside down with regard to map orientation.

The Photo Coordinate Card. It is difficult to indicate the location of objects on an aerial photograph because of the lack of names and of a grid system. Location is therefore indicated by means of a coordinate card especially designed for use with aerial photographs. The method, in general, of handling the card is the same as that for using the coordinate cards in map reading. The card is divided into inch divisions, and each division is subdivided into tenths. The horizontal divisions are given numbers, and the vertical divisions are identified by letters. This is done in order not to confuse them with map coordinates. The left-to-right reading is always given first, followed by a dash and the bottom-to-top reading. The combined figure is inclosed in parenthesis, as in map coordinates. Plate 4 shows the proper use of a photo coordinate card, the coordinates of point "P" being (6.4-E.9). Aerial photographs reproduced by the lithographic process as *photo-maps* often have a coordinate control in tenths of inches printed around the margin. In the absence of a coordinate card photograph coordinates can be read with any ruler graduated into inches and tenths. Measure the distance across from the left edge, and then the distance up from the bottom, expressing the major divisions of the last measurement in letters.

Legend. A legend giving necessary identification information is placed on the lower edge of photographs beginning at the lower left-hand corner. The following is a typical legend:
(V-43-74OC-16 OBSN) (12-21-36-9:32A) (12-15000)

The legend as shown above indicates that the photograph is a vertical, that its serial number is No. 43, and that it was taken of area 74OC by the 16th Observation Squadron. It also indicates that the picture was taken on the 21st of December, 1936, at 9:32 in the morning, and that it was taken with a camera having a 12-inch focal length lens from an altitude of 15,000 feet. The name of the most important terrain feature, or the map coordinates of the center of the photograph are often added when known. In the case of a series of photographs taken for mosaic purposes this legend may appear on the first and last print of the series, the others showing their serial numbers only.

Recognition of Features. *a. Recognition and identification of features.* The recognition and identification of features on an aerial photograph are easy. One sees familiar things, and sees them as they actually appear. Unlike the map, which resorts to artificial signs or symbols to represent ground features, the photograph literally provides a picture of the feature itself. For this reason, in order to read photographs skillfully and accurately, the reader must be familiar with the appearance and characteristics of original ground features. The photograph, being taken from above, shows features in their horizontal plan only. This is excellent for showing cities, roads, woods, fields, streams, and all the natural ground features. In the case of a feature whose special identifying characteristic is its vertical profile, such as a church steeple, factory chimney, silo, or water tank, its identity may not be apparent directly from the photograph. However, shadows, when present, often outline its profile on the ground and thus disclose its identity. Shadows by their relative lengths often disclose the relative heights of buildings and trees. On the other hand, when the buildings or trees are known or suspected to be of uniform height, the relative lengths of shadows cast indicate the direction and amount of ground slope, if any.

b. The part played by color. The eye is very sensitive to color. Therefore, color plays an important part in our daily recognition of features. The aerial camera on the other hand does not record color, but evaluates the things that come within its focus in terms of their light reflecting properties. Light colored objects usually reflect more light than dark ones and therefore appear *lighter* on photographs. But all colors do not reflect light in the degree that one might expect, and the texture of a surface may have a greater effect upon its light reflecting properties than its color. Shadows reflect almost no light and therefore show up black on photographs and are very prominent for this reason.

c. Roads. Exposed earth reflects light well, and therefore roads, paths, construction work, and cultivated fields appear white on aerial photographs. Improved roads may be recognized by their greater and more uniform width, and their more regular curves. Primary gravel roads usually appear wider and often lighter than paved roads. Railroads are usually darker, and narrower than highways, with long straight tangents and

more gentle and accurately engineered curves. Plates I, VI, VIII, and IX contain various types of roads and the last two contain railroads.

d. Details revealed by the camera. Woods may usually be identified as such by their characteristic tree composition. They usually appear as dark patches, not only because they are of a darker color, but because each branch and leaf is casting shadows on lower or adjacent branches, leaves, or the ground itself. Though the camera may not record the individual shadows, it, nevertheless, is sensitive to the reduced light reflection of the area as a whole caused by the general prevalence of shadows. For this same reason tall grass with its longer shadows appears darker than short grass, even though to the naked eye there is no perceptible difference of color and the shadows themselves may escape notice. The camera is so sensitive to light that it records the difference in the amount of light falling on reverse slopes as compared to forward slopes, even though the sun is shining directly on both. This is the case with the finger-type drainage area noted on Plate III. A realization that the camera records all detail in terms of light reflecting properties greatly facilitates understanding aerial photographs. Plate VII, center, contains patches of thick woods, thin woods, scattered trees, grass land, and areas partly devoid of grass due to surface erosion. Plates X and XI also show various types of woods. In Plate VII, bottom, there appear some dark areas that are not woods but are the shadows of small clouds.

e. Water is revealed by the camera. Clear water does not reflect light and therefore shows dark on photographs (Plate VII, center), but if the water is muddy the dirt particles in suspension tend to reflect light, and the water will appear grey and at times quite light. The trace of streams that cannot be directly seen may be identified by their characteristic pattern and by the more luxuriant vegetation along their courses. Plate VII, top, shows a winding stream with sandbars at the bends. It also shows a primary highway and bridge. Plate X shows a characteristic drainage pattern. Plate XI shows minor drainage of various types. In the upper left are minor drainage lines through cultivated ground; in the left center one can see a small stream bed passing through grass land, probably a pasture; in the right center are wooded stream lines passing through a lightly wooded area; at the upper right are artificial drainage ditches in a cultivated stream bottom. Incidentally, the upper left corner of this particular photograph shows with unusual clarity the terracing of cultivated slopes. Such terraces are to prevent soil loss through erosion, and they run at right angles to the direction of slope. Thus they have the characteristics of contours, and as such clearly indicate ground forms.

f. Minor details. The identification of minor detail depends primarily upon personal familiarity with the characteristics of the original features. On Plate IV the military reader would easily identify as such the trench system in the center of the plate. He would also quickly recognize the four light spots at (0.75-B.60) to be an artillery firing position, because of the arrangement of the spots. The guns themselves cannot be detected but the four white spots are peculiar to bare earth exposed by the muzzle-blast of field pieces. Likewise, the dark objects at (2.6-A.3) are characteristic of motor vehicles halted off the road.

A good reading glass brings out a wealth of detail and is a great aid in studying photographs.

SCALES AND AZIMUTH

Scales. The aerial photograph shows the features of the ground such as the roads, streams, woods, fields, and villages in their relative sizes, distances and directions one to the other. In this respect the photograph may be considered as a map and all the data regarding size, distance, and direction obtainable from maps can be secured from the aerial photograph by applying the methods and procedure normal to map reading. However, the photograph as at present issued to the using services frequently does not show scale and orientation data. It is, therefore, necessary for the user to determine these basic data for himself before the photograph can be used conveniently, or to the full extent of its capabilities. Scales are usually expressed as a representative fraction. A representative fraction is the mathematical relation of a unit of map (photograph) measurement to the corresponding ground measurement, expressed as a ratio of similar units.

Determining Scale. *a. By focal length and altitude.* The triangle formed by the negative

and the lens within the camera is similar to the triangle formed by the lens and ground area included in the exposure. Since these are similar triangles the relation of the two bases (the size of the photograph as compared with the ground area) will be the same as the relation existing between the bases of any two similar triangles. (See Plate 5.) The third group of data shown in the legend usually appearing on individual prints gives the focal length in inches of the camera used and the altitude in feet at which the picture was taken. Therefore, the ratio established by these figures is the same ratio as that of the photograph to the ground, or of any portion of the photograph to the corresponding portion of ground. Accordingly, it constitutes a photo-to-ground ratio and needs only to be reduced to common units, and to unity, to be the representative fraction of the photograph.

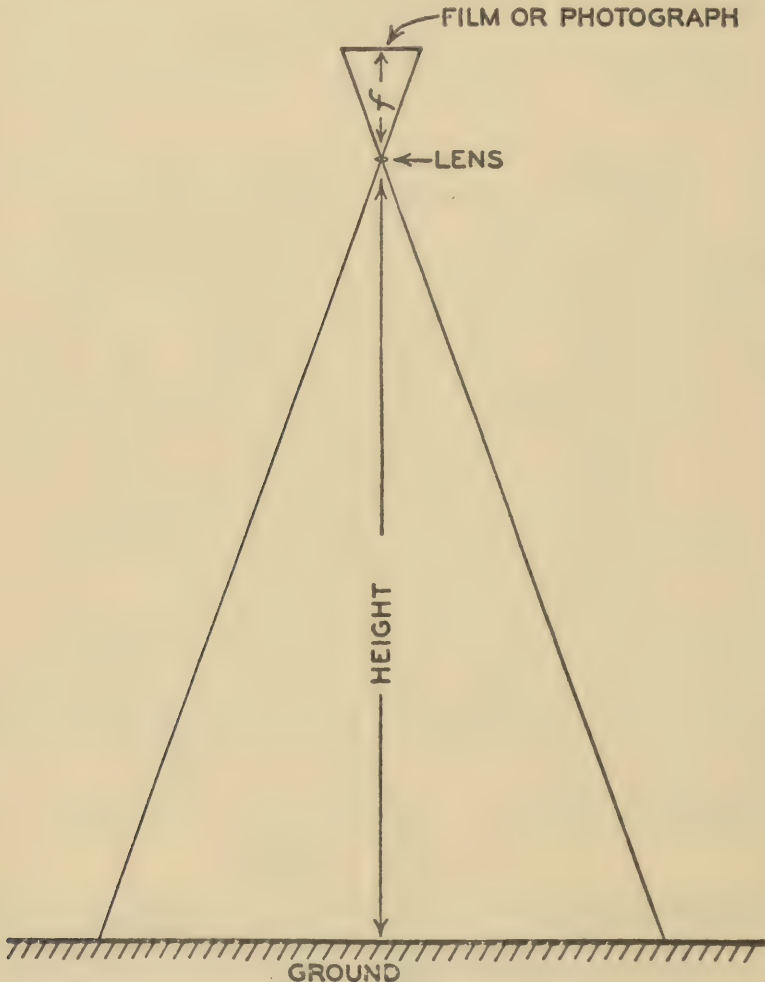


Plate 5. The Scale (RF) of a Photograph is the Ratio of the Focal Length to the Height.

In the case of a photograph showing the legend data, "(12—15,000)," its representative fraction is determined as follows:

$$\begin{array}{rcl}
 & \text{"(12—15,000)"} & \\
 12 \text{ inches} & : & 15,000 \text{ feet} \\
 1 \text{ foot} & : & 15,000 \text{ feet} \\
 1 & : & 15,000 \text{ (RF)}
 \end{array}$$

The two cameras most frequently used have focal lengths of 12 inches and 8.25 inches respectively. The representative fraction of a photograph taken with the latter camera, and showing the following data, "(8.25—13,000)" would be determined as follows:

$$\begin{aligned} & \text{"(8.25—13,000)"} \\ 8.25 \text{ inches} & : 13,000 \text{ feet} \\ 8.25 \text{ inches} & : 156,000 \text{ inches} \\ 1 \text{ inch} & : 18,909 \\ & 1 : 18,900 \text{ (approximate RF)} \end{aligned}$$

With cameras of any other focal length the representative fraction is determined in a similar manner, using the focal length and height data given in the legend.

The scales determined by the method shown above are only approximately correct. The altitude as set forth on the photograph is often the altitude of the plane above sea level. Should the mean ground level be considerably higher than sea level the height of the plane above the ground should be determined and used in the calculations. The height of the plane is its altitude above sea level minus the mean elevation of the ground area.

b. From the map. When a map of the area is available the scale of the photograph can be easily determined. It is ascertained by finding the ratio existing between the length of any line on the photograph and the corresponding distance on the ground. The photo distance is measured on the photograph with a ruler. The ground distance is determined by normal map reading methods. For example, we wish to determine the scale (RF) of Plate II, using the map in Plate 15 for data. The line from the CR at BM 346 (16.2-19.3) to the nearest water tank on EBBERT HILL (18.8-19.7) is selected for the datum line. This line measured on the map by means of its graphic scale is found to be 2660 yards or 95,760 inches of ground distance. The same line located and measured on the photograph measures 6.70 inches. We find that 6.70 inches on the photograph equals 95,760 inches on the ground. Therefore, 1 inch on the photograph equals 14,293 inches on the ground and the scale (RF) of the photograph is 1:14,300.

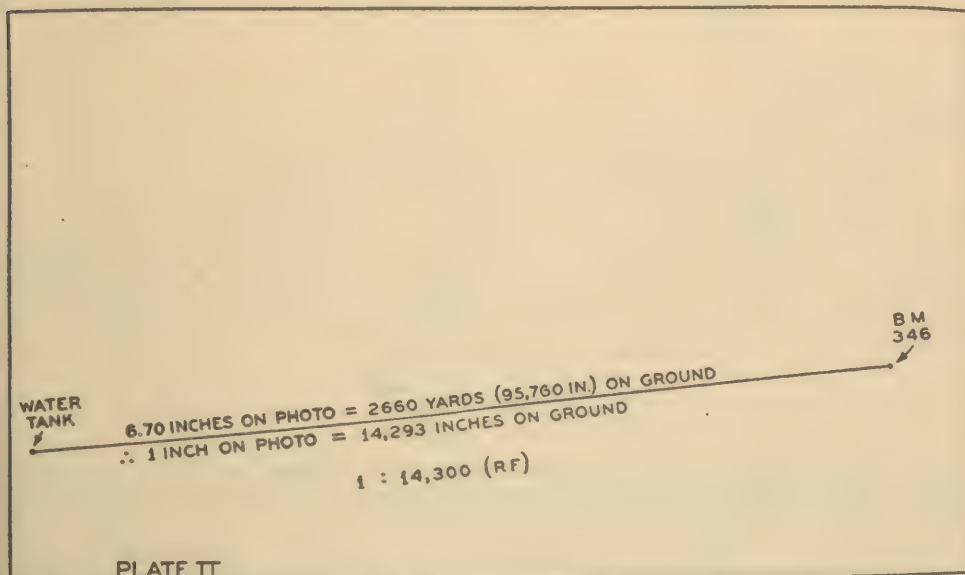


PLATE II. Determining the Scale (RF) of a Vertical Photograph by Means of a Ground Distance Secured from a Map.

Datum lines selected for the purpose of making scale computations should be as long as possible, and preferably should pass through the center of the photograph rather than along an edge. When accurate results are desired two or more different lines should be used and computed, and the average of the separate computations determined.

c. *From the ground.* The scale (RF) of an aerial photograph can be determined from the ground itself whenever a map is not available. The scale of the photograph shown in Plate I would be determined in the following manner. The main road from the crossroads at (7.20-A.53) to a point at (1.31-A.28) where the small curved trail joins the road is selected for the datum line. Measured on the ground by means of an automobile odometer, it is found to be 2.61 miles. The same distance measured *along the road* on the photograph in inches is found to be 7.34 inches. Therefore, 7.34 inches on the photograph equals 2.61 miles, or 165,369.6 inches, on the ground with the result that 1 inch on the photograph equals 22,530 inches on the ground. The scale (RF) of the photograph would therefore be expressed 1:22,500. The ground measurement could have been determined by pacing, by using a tape, or by any other means.

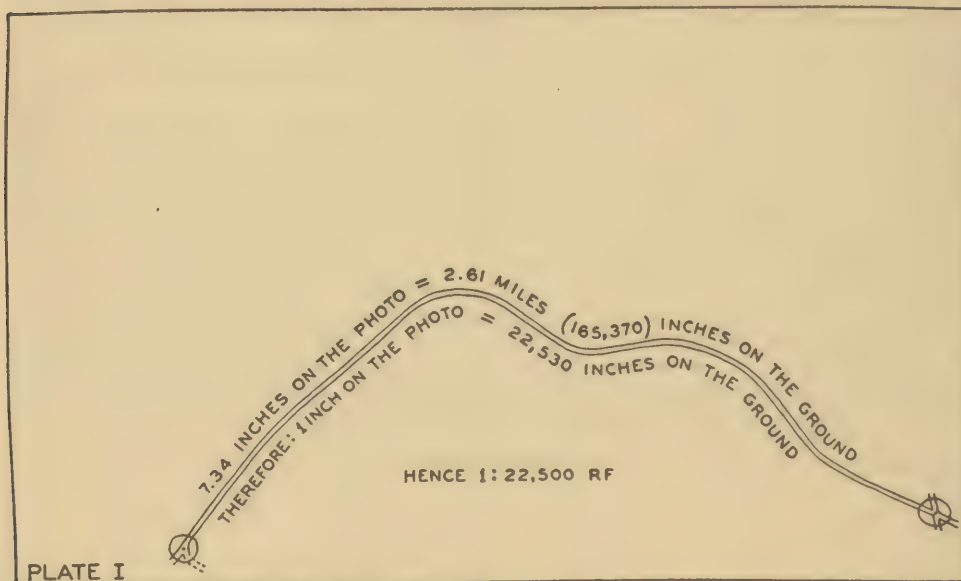


Plate 7. Determining the Scale (RF) of a Vertical Photograph. The Ground Distance Was Determined by Measurement on the Ground.

d. *Making a reading scale.* A scale expressed in representative fraction form is of little value in making measurements of distance. For the purpose a graphical reading scale is more serviceable and should be constructed. A reading scale of 1000 yard units is the most convenient. The scale of the photograph in Plate II was determined (in *b* above) to be 1:14,300. This means that one inch on the photograph equals 14,300 inches on the ground. One thousand yards is 36,000 inches.

$$\begin{aligned} 1:14,300 &= x : 36,000 \\ 14,300 x &= 36,000 \\ x &= 2.52 \end{aligned}$$

A line is drawn on the margin of the photograph and divided into 2.52-inch divisions, each of which represents 1000 yards of ground distance. The left division is then subdivided into tenths to represent 100-yard distances.

A photograph coordinate card, divided into inches and tenths of inches, provides a convenient reading scale based on inch units. In the case of plate II whose scale (RF) was determined above to be 1:14,300, this would be done as follows:

$$\begin{aligned} 1 &: 14,300 \\ 1 \text{ inch} &= 14,300 \text{ inches} \\ 1 \text{ inch} &= 399\frac{1}{2} \text{ or } 400 \text{ yards} \end{aligned}$$

The above having been determined, the coordinate card may be used both for location and also for distance measurements.

Direction and Azimuth. a. Orientation. An aerial photograph, unlike a map, is not automatically reproduced on a north-south axis. It is convenient to know the correct orientation of the photograph when using one and this knowledge is necessary when azimuths are to be secured from it for marching or fire control purposes.

An approximate north orientation can be made based on the shadows, when the date and time of day at which the picture was taken are known. An accurate orientation can be made when a map or the ground itself is available. Since the photograph is usually used in conjunction with the ground itself, it is preferable to determine the *magnetic*, rather than the true or the grid orientation, and to use *magnetic azimuths* for all computations.

b. Determining a base azimuth. When a map is available a line is selected that can be accurately located on both the map and the photograph. The grid azimuth of the line is measured on the map and converted to magnetic azimuth. This will be the magnetic azimuth of the same line on the photograph. The protractor is placed on the line on the photograph so that it reads the proper azimuth. A line drawn along the base of the protractor will be the magnetic north or zero line for orientation. For example, in Plate 15 the line from the CR at BM 346 (16.2-19.3) to the nearest water tank on EBBERT HILL (18.8-19.7) has a grid azimuth of $81\frac{1}{2}$ degrees as read from the map with a protractor. Based on the orientation symbol of the map this is a magnetic azimuth of 81 degrees (to the nearest half degree). The same line is drawn on the photograph and the protractor placed thereon, reading 81 degrees. (See Plate 8). The magnetic north will be the line of the base of the protractor, and is so drawn and labeled. It may be plotted at any desired point along the datum line. In the absence of a map, two inter-visible features are selected

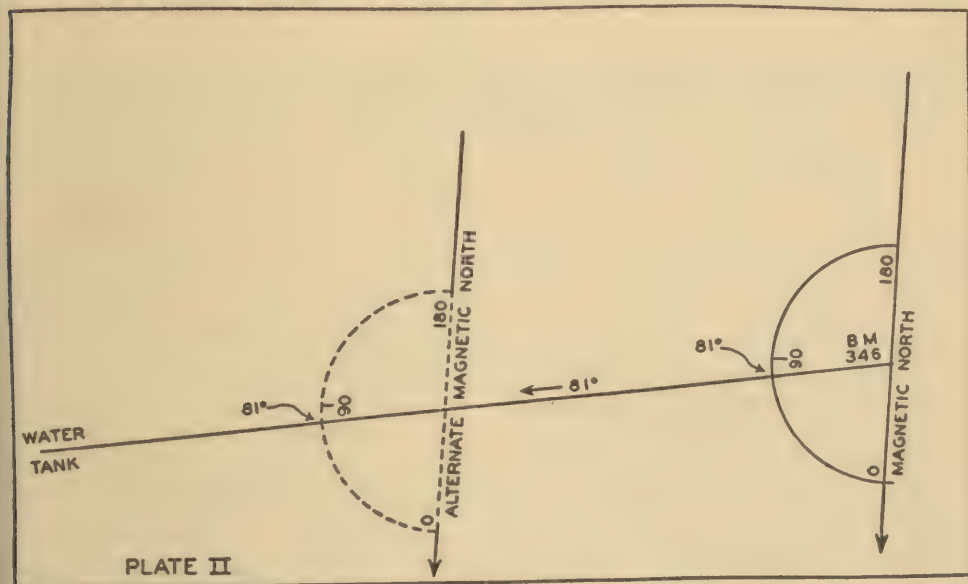


Plate 8. Determining Magnetic North. (Diagram Oriented to the Photograph.)

on the ground that can also be identified accurately on the photograph. The magnetic azimuth of the line thus determined is read on the ground with a compass. The north line of the photograph can then be determined from this data in the same manner as described above.

c. Making azimuth measurements. Once a zero azimuth line has been determined and plotted, the azimuth of any line can be measured by normal map reading methods. Prolong the line whose azimuth is to be determined until it intersects the zero azimuth line, and read the azimuth directly with the protractor. If the zero azimuth line is inconveniently located, another can be plotted at any location desired, either by drawing it parallel to the original line, or by re-basing it on the datum line. It is not necessary that there be a zero line in order to make azimuth readings. Whenever a line intersects another

line the azimuth of which is already known, the protractor can be correctly oriented by placing it with its proper reading on the known line and then reading the azimuth of the unknown line directly from the protractor scale.

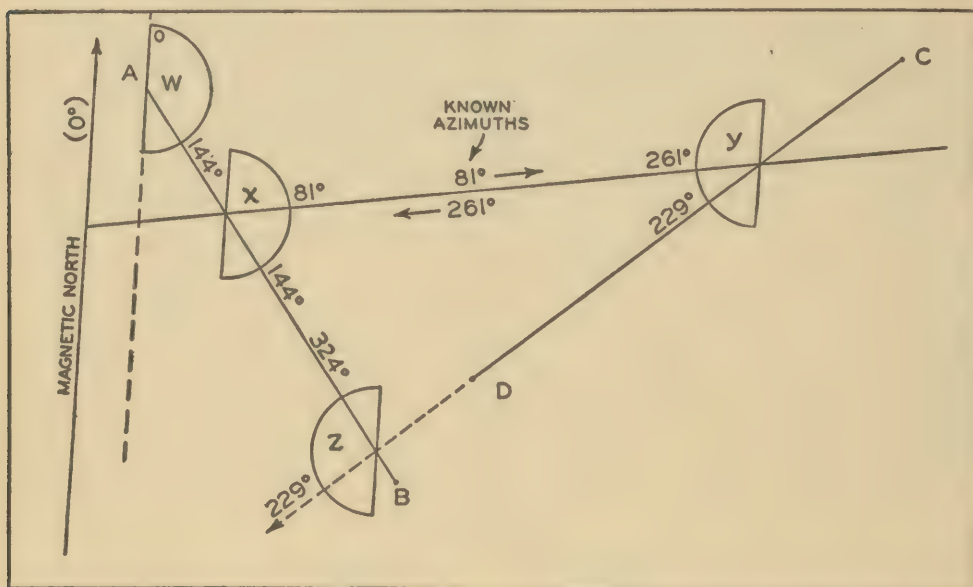


Plate 9. Measuring Photo Azimuths. (Diagram inverted to Approximate North Orientation.)

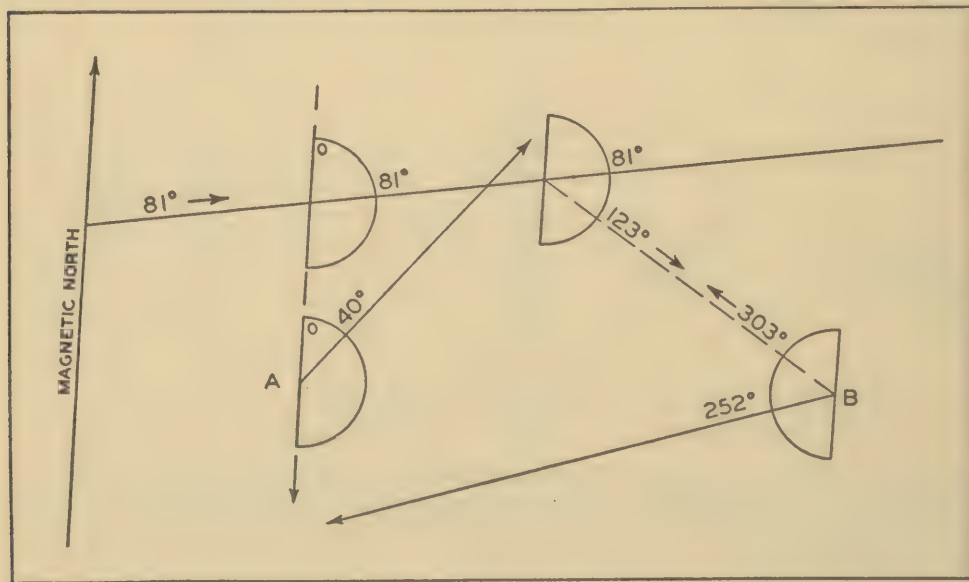


Plate 10. Plotting Photo Azimuths.

d. Methods illustrated. Plate 9 demonstrates various methods of making azimuth readings. A datum line of 81 degrees azimuth (and therefore 261 degrees back azimuth) has been determined and plotted, and a north line plotted therefrom.

(1) w. The azimuth of the line A-B is 144 degrees determined by constructing a new north line through A and orientating the zero of the protractor thereon.

(2) *x*. The azimuth of the A-B is 144 degrees determined at the intersection of A-B with the datum line. The protractor is orientated by placing its 81-degree mark on the datum line.

(3) *y*. The azimuth of the line C-D is 229 degrees determined at the intersection of C-D with the datum line. The protractor is oriented by placing its 261-degree mark on the datum line.

(4) *z*. The azimuth of the line C-D is 229 degrees determined by extending it until it intersects line A-B, whose azimuth has previously been determined to be 144 degrees, hence back azimuth of 324 degrees. The protractor is oriented by placing its 324 degree mark on the line B-A.

c. Plotting azimuths. In order to plot an azimuth it is necessary to have for a base a line of known azimuth at the point from which the new azimuth is to originate. A north (zero) line can be erected through the point by orienting the protractor to a known datum line and sliding it along the line until its base line, extended if necessary, passes through the point. Or, a line can be drawn into the point and its azimuth determined as in *c* and *d* above. The azimuth or the back azimuth of this line will then serve for orienting the protractor.

Plate 10 demonstrates various methods of plotting photo azimuths. A datum line of 81 degrees azimuth and a north line based thereon has been determined and plotted.

(1) An azimuth of 40 degrees is to be plotted from A. A zero base line is constructed through A by sliding the protractor along the datum line with a reading of 81 degrees until its base line passes through A. The protractor is then moved to and oriented at A and an azimuth of 40 degrees is plotted.

(2) An azimuth of 252 degrees is to be plotted from B. A line is drawn from any convenient point on the datum line to B, and the azimuth (123 degrees) and back azimuth (303 degrees) of this line determined by methods previously covered. The protractor is moved to B and oriented by placing its 303-degree mark on this line, and the desired azimuth of 252 degrees is then plotted.

MILITARY TERRAIN FEATURES AND STEREOSCOPIC RELIEF

Military Terrain Features. *a. General.* A successful commander is the one who most skillfully utilizes the favorable features of the terrain, and who also knows the unfavorable features so that he can make proper plans to avoid them or to minimize their effect. In general, the most important military features of the terrain are the road net, the wooded and open areas, and the basic tactical relief. A good military map shows all these features. However, with regard to the first two, they are constantly changing. Old roads are improved or abandoned, and new roads put in. Woods are cut down for lumbering purposes or converted into cultivated land. Land formerly cultivated is often abandoned and soon grows up into brush and woods. A good map shows these features as they were at the time of the compilation of the map, but many important changes may have occurred since its compilation. Fortunately, these two types of features, roads and woods, are clearly and unmistakably shown on aerial photographs, being the most easily read features on them. Therefore, in the items in which the map is least trustworthy, the photograph is especially clear. The photograph does not show relief quite as clearly or in such detail as does a topographic map. However, the relief of an area is not subject to pronounced change over a period of years. Accordingly, in the one item in which the photograph is weak the map can still be depended upon. The map and the photograph, used in conjunction with each other provide a most reliable means of studying the terrain. The map furnishes names and relief data, while the photograph provides up-to-the-minute data on existing roads, woods and open areas.

b. Roads are very prominent on aerial photographs, and the details of the road net are quite apparent. From a military point of view more must be known about roads than their location and pattern. Information concerning the nature of the road itself is desirable. Improved roads are generally wider than unimproved roads, and their curves are more regular and gentle. Main improved gravel roads are usually wider than paved roads. Oiled or tarvia type roads show darker than those made of concrete or gravel. Old con-

crete roads are darker than dirt or gravel roads because of the oil drip from the motor traffic, and in low photographs the double oil drip streaks of the two traffic lanes can often be detected. Unimproved roads are narrow and irregular in width and follow a much more erratic course than improved roads. This is due to the necessity of avoiding steep grades in their construction. They often follow slopes in an angular fashion and pass around hills, spurs, and draws.

Plate IX shows several highways and a railroad converging toward a city. The roads at the lower left and lower center of the plate are obviously old roads as they show many houses along their route. The road across the center is a wider road and for this reason probably a main highway. It is very recent because as yet it has practically no houses along its course. From its general trace it appears that it must be a re-routing of the older road. The road across the top is also wide, probably a main primary road, and from its numerous houses is not a new road. Plate VIII also shows several roads, both primary and secondary, and also the darker course of a railroad. The unusually wide road at the top center with its "fuzzy" edges suggests that the cuts and fills, the borrow pits and waste piles, and perhaps the ditches along the side are still bare earth and not yet grown over with grass or weeds. It is probably a very recently completed improved dirt or gravel road, and in fact, may still be under construction. Incidentally, it is in a valley following along a stream line while all other roads in this area seem to follow the tops of ridges. On Plate I at (2.35-A.55) the "needle eye" formation is characteristic of a place in a road so poorly constructed that, on occasions, traffic must detour, thus forming by-passes. Such detail is invaluable in disclosing the nature of roads. From this one item one can deduce that this road may at times be very bad, and that it should be reconnoitered before being used. Such information can never be secured from maps.

c. Woods are important military features. Woods in front of positions obstruct fields of fire of the defense, and offer covered avenues of approach for the attack. Woods in the rear areas afford concealment for reserves, supply points, command posts, train parks, and similar installations. Therefore, the location and the extent of the wooded area is essential military information. It is also desirable to know the nature of the woods. Woods consisting of mature trees so closely spaced that the branches interlock (Plate III, right center) have vastly different military value from woods whose trees are so spaced that much of the ground is clearly visible (Plate III, lower right and lower left center). Maps do not generally show this distinction, but it is clearly evident on aerial photographs.

d. *Relief*. Relief is not as easily read from aerial photographs as from topographical maps. Nevertheless, aerial photographs contain much information regarding the basic relief of an area. Good shadow values often picture the relief of the area directly, as is the case with the finger drainage on Plate III, and also in portions of Plate IV. Also, the relative lengths of shadows of buildings and trees of similar height often disclose the direction and the amount of slopes. Terracing, when present, is a clue to relatively rugged country, and can often be seen in photographs as in Plates VIII, IX, and XI. To all intents and purposes they can be considered as form contours and serve as such for indicating relief. Bends in the routes of unimproved roads where they pass around ridges, spurs, and draws, are likewise valuable clues to relief. The most valuable source of information regarding relief, however, is the drainage net, which can be clearly followed on photographs. Relief, that is, the valleys and the ridges, is the result of water erosion. The streams carve out the valleys, and every stream line discloses the location and the direction of a valley. Between any two adjacent streams there must be a ridge line, and its location and direction must conform to the two streams between which it lies.

Streams, or drainage lines, follow definite natural laws and for this reason have easily recognizable conventional patterns. Plate X shows a typical drainage pattern. Plate XI shows various types of minor drainage and their characteristic patterns in various types of background terrain. In both cases the patterns of the drainage lines are clearly marked by the more luxuriant vegetation along their courses. They can be traced out on the photograph, or on an overlay, and will furnish the pattern of the low ground of an area. By placing a form ridge between each two adjacent stream lines, its location approximately centered, and its direction conforming to the stream lines, one will have a pattern of the

ridge framework. Such a framework will not perhaps be exactly true to the ground in all details, but the picture it presents of the general location, direction, and extent of the ridges with their lateral spacing will be a reliable picture of the basic terrain structure of the area. The location, direction, size, and extent of the terrain corridors and cross-compartments thus disclosed can be relied upon for planning tactical operations.

On Plate VIII it is easy to see that the drainage lines all run away from the village. From this it is evident that the village is situated on high ground. Further study of the stream lines shows the village to be on a ridge, and that the main transverse highways and railroad follow along this ridge. The tactical significance of such information is valuable. The higher buildings of this village should offer good observation points and overlook much of the surrounding territory. Also, the roads, being on a ridge, can probably be seen from quite a distance, and troop movements thereon by daylight could be observed by the enemy. Plate 11 shows a tracing of the drainage system of Plate XI. Plate 12 shows the ridge lines added, based on the drainage system. The combined plotting discloses the basic terrain structure of the area. It does not show the details of the minor relief nor the relative heights of the ridges and hills. This data, if needed, can be determined through stereoscopic study.



Plate 11. Basic Terrain Structure
(Drainage lines traced from the photograph.)

Stereoscopic Relief. When a person looks at an object or a landscape both eyes do not register identical images. Because of the lateral spacing between the eyes each eye sees each object from a slightly different angle. The mind takes these two sight impressions and combines them and produces from them a single picture which contains the perception of depth or of the third dimension. This is possible only because of the two separate and slightly different views presented.

In photographing an area for the purpose of constructing a mosaic, the pictures are taken so that there will be considerable overlap. This insures that there will be no gaps, and assists in fitting the pictures together. An overlap of about 60 percent in adjacent pictures is standard procedure. Therefore, on any two adjacent pictures there will be a large part of the area common to both pictures. Moreover, since the plane will have flown some distance between the exposures, the second picture will be from a different position and therefore a different angle from the first. Each picture is considered to be the view that each of the eyes of a person would register if the eyes were at the altitude of the plane.

and the spacing of the eyes were the many hundreds of yards of horizontal distance between the two exposure points. By causing one eye to see one of these pictures only and the other eye to see the other picture only, the result will be similar to that experienced in normal vision, and will permit a perception of depth, thereby disclosing relief.

This is done by the aid of an instrument known as the *stereoscope*. By means of mirrors, prisms, or lenses, it directs the sight of one eye to one picture, and of the other eye to the other picture, and the result gives clear perception of the relief of that portion of the area common to the two pictures. In fact, due to the great distance between the points from which the successive pictures were taken, the relief disclosed by the stereoscope is usually quite exaggerated, and one must evaluate it accordingly.



Plate 12. Basic Terrain Structure.

Ridge lines added by inspection based on the drainage traced in Plate 11.

The stereoscope itself is not necessary for stereoscopic vision. It is only a convenience. Stereoscopic effect is obtained when one eye sees one picture only, and the other eye sees the other picture. Plate XII shows a *stereoscopic* pair, or pictures of the same area cut from the overlap portion of successive prints, and arranged and spaced for use without instruments. Place the plate on the desk about 14 to 18 inches from the eyes. Hold a piece of cardboard vertically between the two pictures so that each eye can see only its respective picture. Permit the eyes to relax somewhat, do not concentrate or stare. Continue to look at the pictures and the stereoscopic effect will develop. Some persons may have to try several times before they get the knack, but nearly everyone attains it with practice.

The same effect can be attained with no aids whatever. Focus the eyes on some distant point, 20 feet or more away, and relax them (day-dream). Move the plate into the line of vision without permitting the eyes to look directly at it or to focus upon it. Rather, look through the plate in a dreamy manner. After several tries the stereoscopic effect should develop.

Summary. A reasonable knowledge and proficiency in *Aerial Photograph Reading*, to meet the needs of the tactical officer, involve the following:

- a. A knowledge of the various types of aerial photographs, and the ability to classify any individual print.
- b. A basic conception of the effect of altitude upon detail registration and amount of area.
- c. An understanding of the data furnished in a legend.
- d. An understanding of the use of the photo coordinate card.

- e.* The recognition and the correct evaluation of roads and road nets.
- f.* The recognition and the correct evaluation of various forms of vegetation in so far as they may afford cover and concealment, or affect fields of fire.
- g.* The ability to plot the outline of a photograph onto a map by inspection, that is, the recognition or terrain detail along the edges.

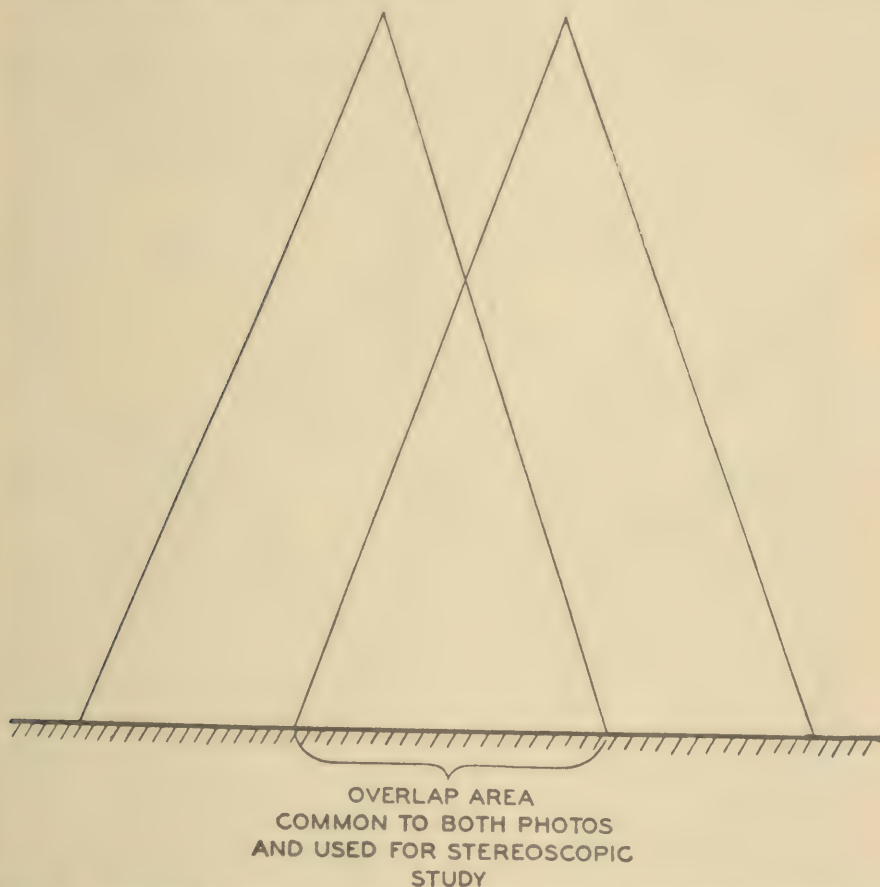


Plate 13. Successive Prints of a Mosaic, Showing Overlap Area Which can be Used For Stereoscopic Study.

- h.* The ability to compute the scale (RF) of a photograph by any of the following means:
 - (1) Focal-length and altitude.
 - (2) Ground data secured from the map.
 - (3) Ground data secured from the ground.
 - i.* The ability to construct a graphic reading scale.
 - j.* The ability to secure azimuth orientation data and to perform azimuth computations.
 - k.* The ability to trace out the drainage system, and to form therefrom a reliable concept of the basic terrain structure.
 - l.* The ability to compare the photograph and the map as to essential military features, and to detect any such data appearing on one that is not substantiated by the other.
 - m.* The knowledge of the operation, capabilities, and limitations of the stereoscope.
- A direct comparison of a map with aerial photographs of the same area is often useful under field conditions for the one may clarify that which is omitted or obscured on the other. The process is especially useful in developing a knowledge of the aerial photograph. Plate 15 is a map which has overprinted thereon the boundaries of aerial photographs shown in Plates I, II, III and V which follow.

The following work is recommended as an aid to study.

Compare each of the plates with the map of the same area with regard to:

- (1) The road net.
- (2) The wooded areas.
- (3) The drainage system.
- (4) The works of man.
- (5) Trace out on a sheet of overlay paper the drainage system (stream lines) of Plates IV and X, and compare with the map.
- (6) Plot the ridge structure of Plates IV and X and compare with the map for basic terrain structure.



Plate I. Vertical Photograph 1:22,000.

Photo by Air Corps, U. S. Army

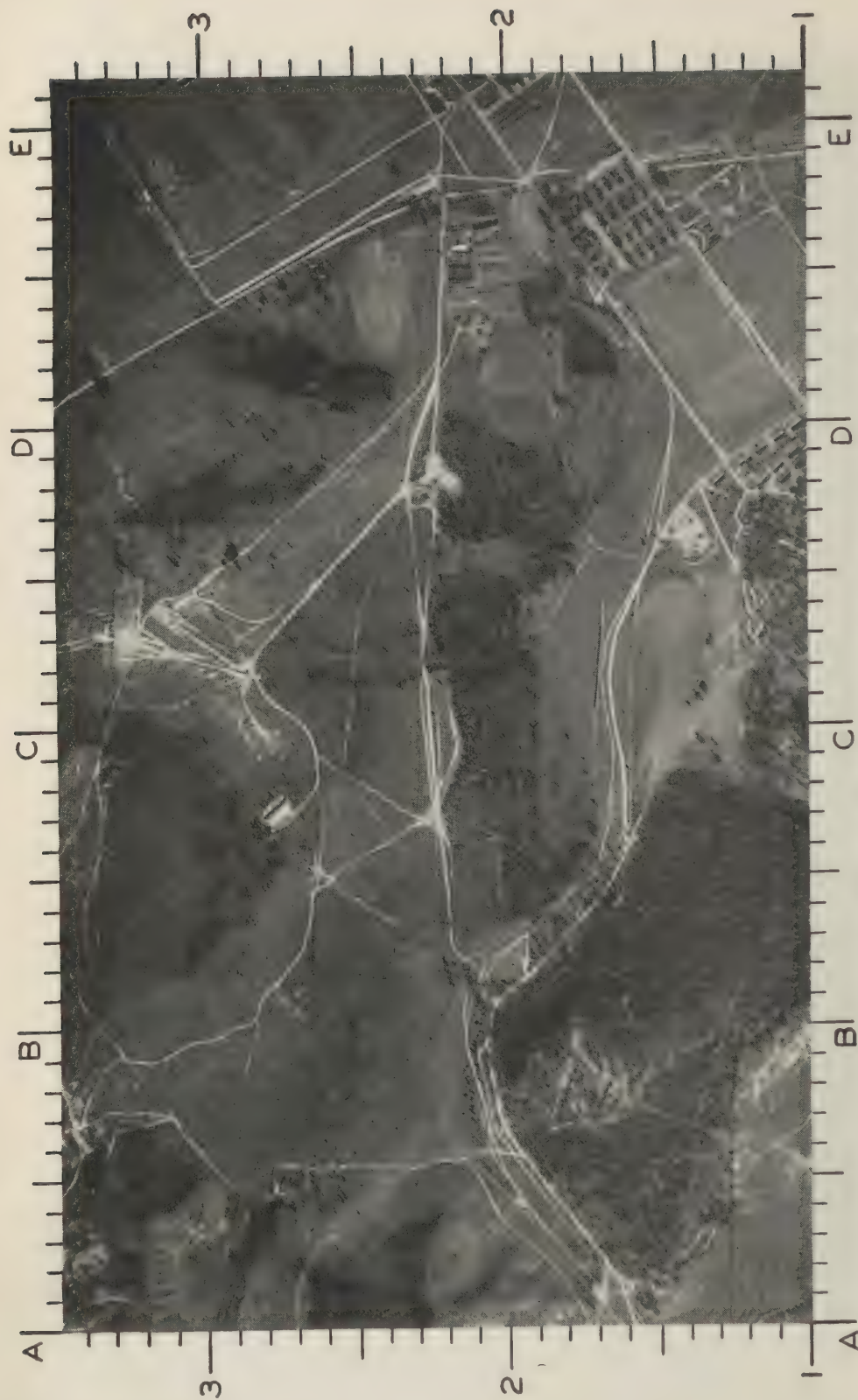


Plate II. Vertical Photograph. 1:14,000.

Photo by Air Corps, U. S. Army

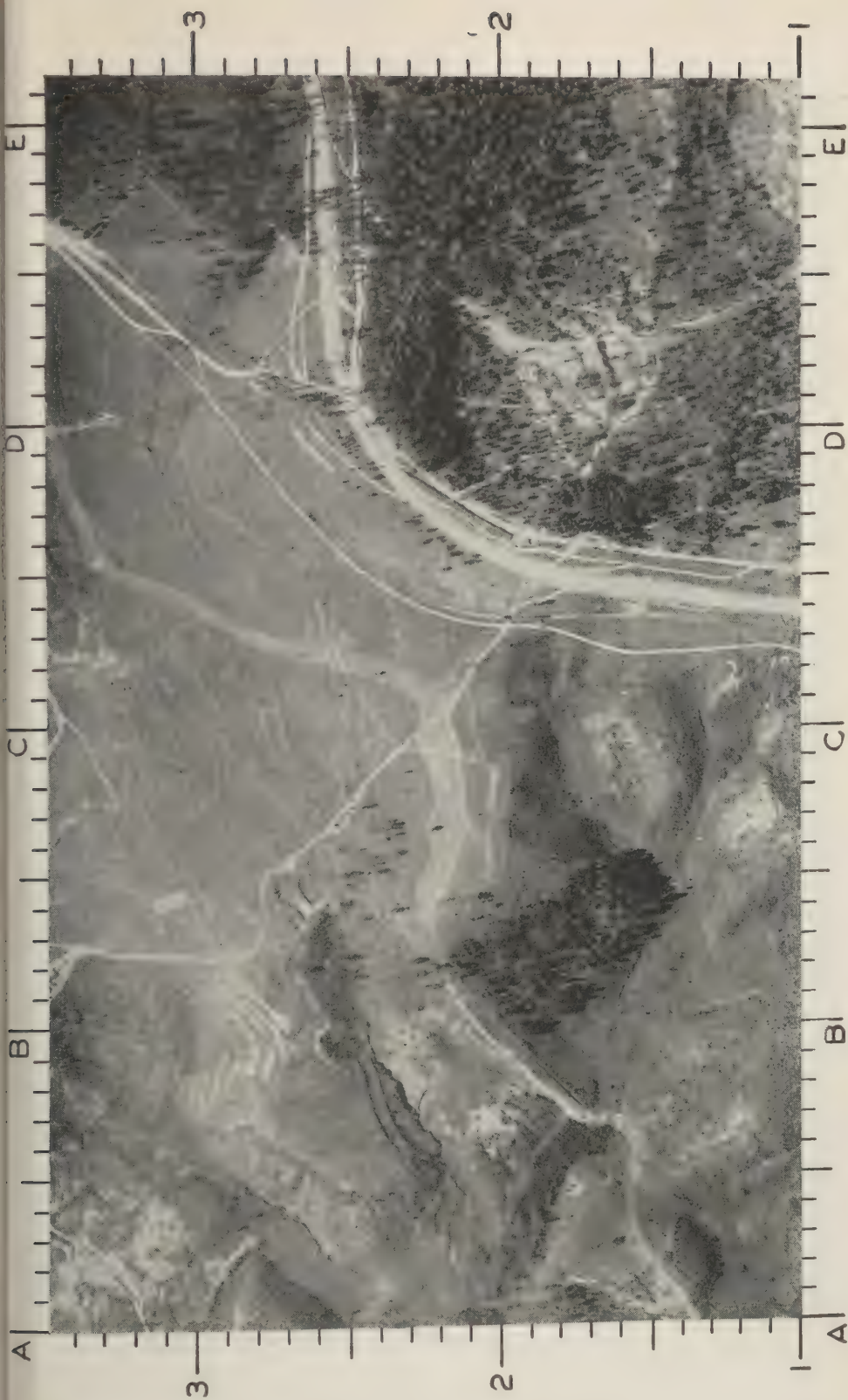


Plate III. Vertical Photograph. 1:8,000.

Photo by Air Corps, U. S. Army



Plate IV. Vertical Photograph.

Photo by Air Corps, U. S. Army

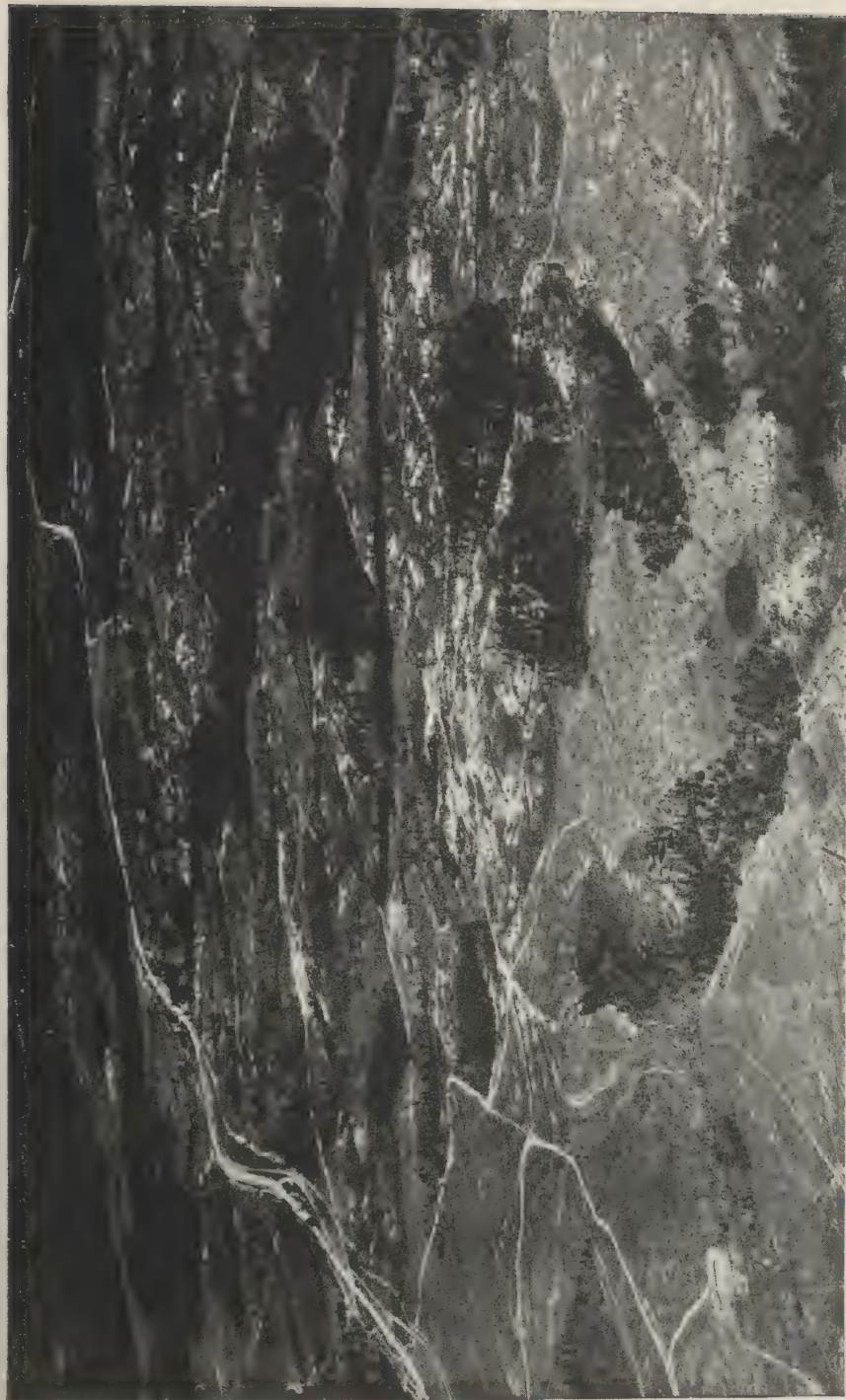


Photo by Air Corps, U. S. Army

Plate V. Oblique Photograph. 3000 feet.



Photo by Air Corps, U. S. Army

Plate VI. Oblique Photograph. 5000 feet.

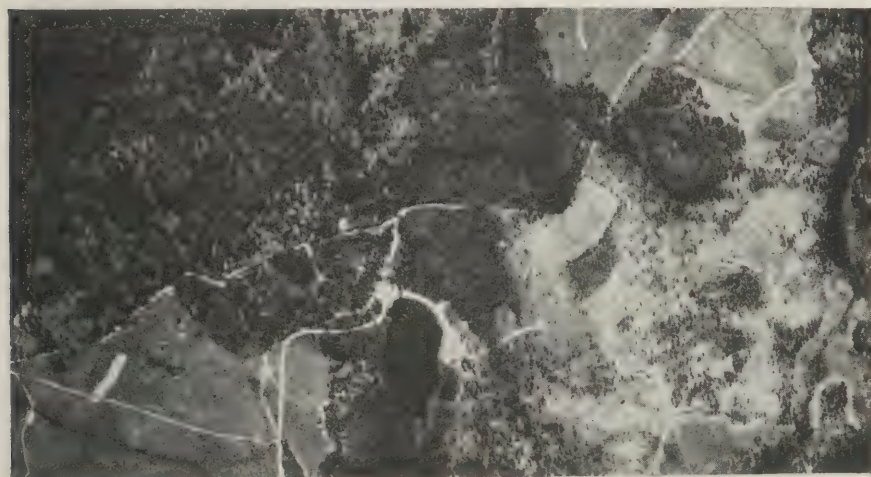


Plate VII.

Photo by Air Corps, U. S. Army

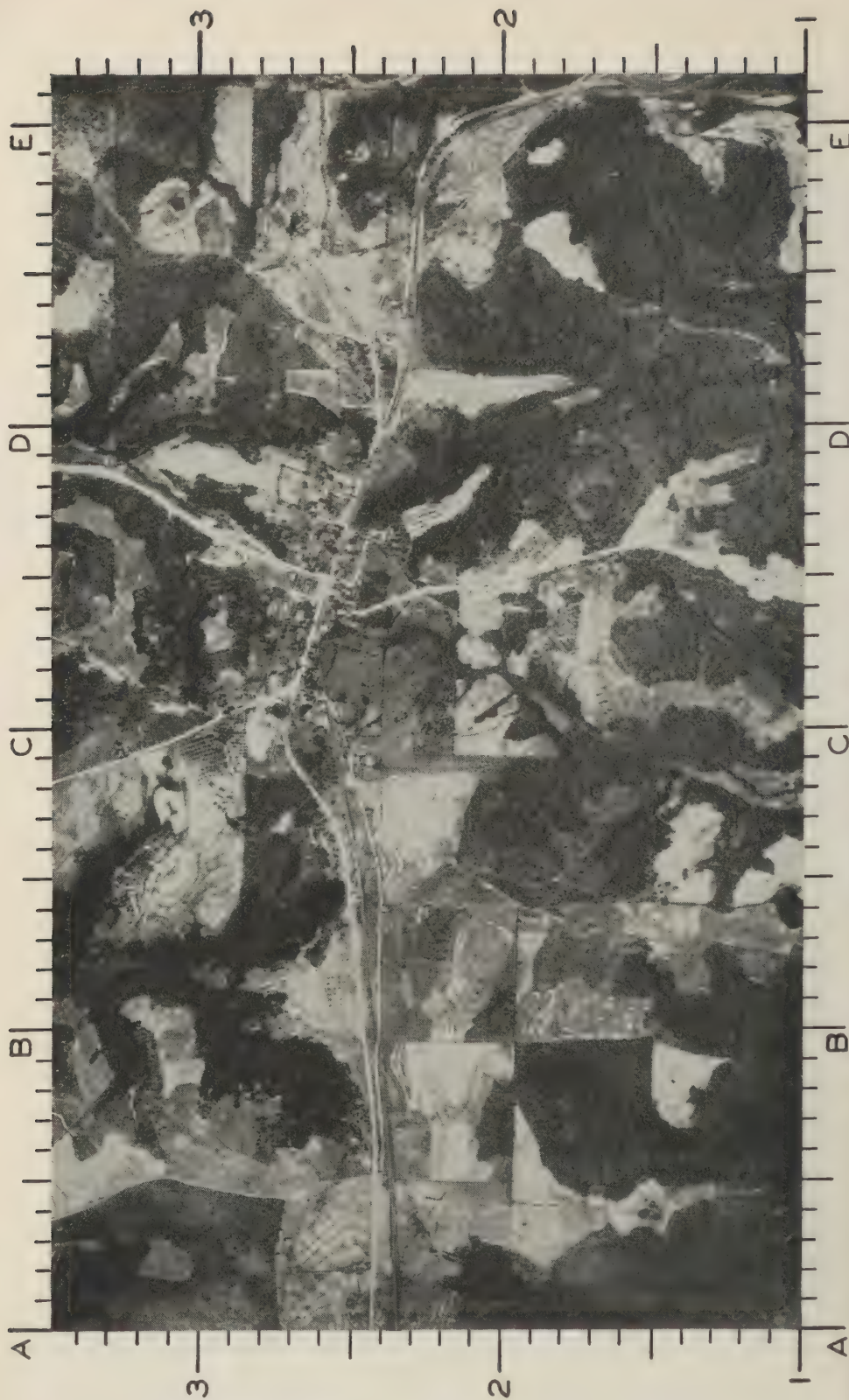


Photo by Air Corps, U. S. Army

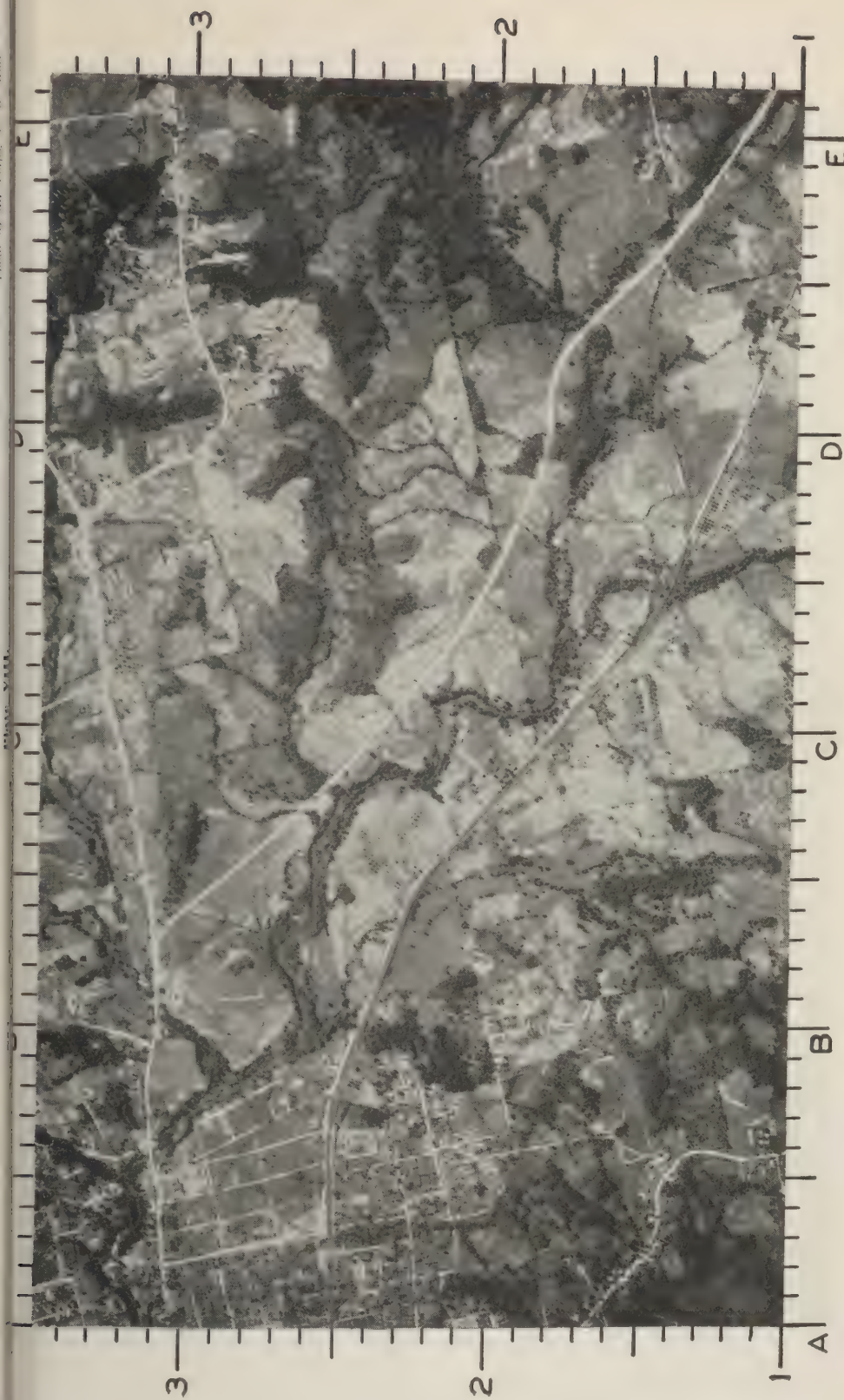


Photo by Air Corps, U. S. Army

Plate IX.



Plate X. Typical Drainage System.

Photo by Air Corps, U. S. Army



Photo by Air Corps, U. S. Army

Plate XI. Types of Minor Drainage.

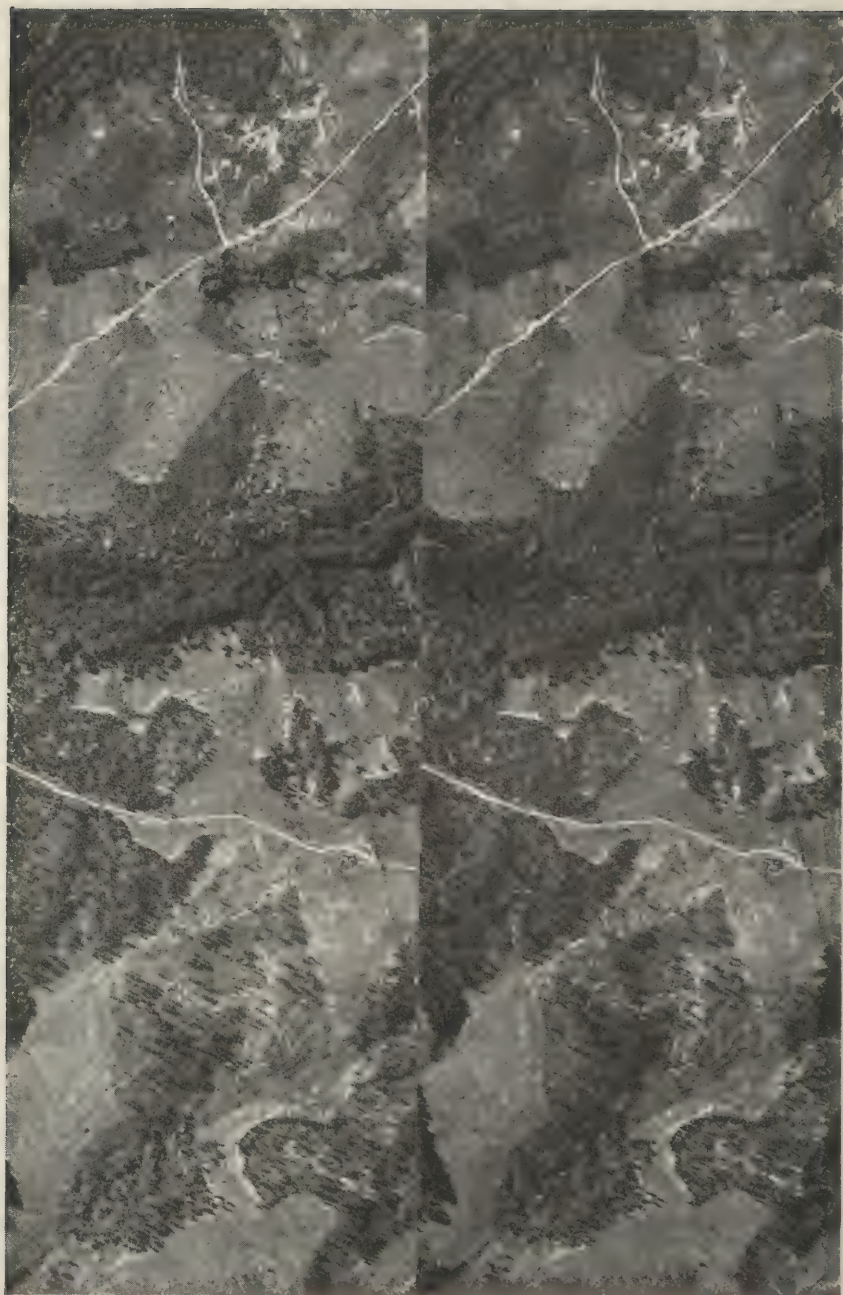


Plate XII. Stereoscopic Pair.

Photo by Air Corps, U. S. Army

CARE AND OPERATION OF MOTOR VEHICLES

CHAPTER XI

INTRODUCTION

Definition. The term "motor transport," as used in the military service, applies to motor-propelled vehicles used for transporting military personnel weapons and supplies.

Employment. Uses. Military motor transport is used for the movement of troops, matériel, and supplies in both strategic and tactical operations. All types of movements are included, from those of small units by organic transport to those of large forces by the army motor pool.

Supplementary transportation. When commercial motor vehicles are used for emergency troop movements, special consideration must be given to their nonuniformity.

Motor Transport Pools. In general it will be found that a pooling of effort in the use of motor transport will give the most efficient and economical results (AR 850-15).

Administrative pool. Ordinarily, when motor transport is pooled, it is done administratively. In this type of pool, the vehicles and personnel remain with the organizations to which they are assigned and operate from the organization motor parks.

Physical pool. In some cases the actual forming of a physical pool of vehicles and personnel is advisable. This is normally confined to the pooling of motor transport units and on rare occasions to tactical vehicles, although a large pool of vehicles will be assigned for army use in actual combat.

Requirements for Efficient Operation. Assignment of drivers. A driver and, if authorized, an assistant driver should be assigned to each motor vehicle. Except for instruction, inspection, or other like purposes, the vehicle should not be operated by other drivers if it can be avoided.

Vehicle abuse. Vehicle abuse is the chief cause of mechanical failures, excessive operating and maintenance costs, and general unsatisfactory performance of the motor vehicle and its component parts. The following forms of vehicle abuse should be prohibited:

- Improper use of controls, particularly gear shift, clutch, brakes, and choke.

- Racing engine, especially when cold.

- Overspeeding, particularly over rough roads and across country.

- Improper lubrication.

- Deferred maintenance, including lack of proper servicing and adjustments.

- Lack of systematic inspection and follow-up.

- Overloading and improper loading.

Speed limits. The caution plate mounted on a motor vehicle indicates the maximum safe speed for which the vehicle is designed. In no case should this speed be exceeded.

- Fast driving over rough, slippery, or congested roads should not be permitted.

- Applicable speed limits set by State or local regulations should not be exceeded.

- Regulated governors, when installed, should be set and sealed at the maximum speed considered safe and not to exceed that indicated on the name and caution plate.

- Tanks and combat cars will be driven habitually by the tachometer in an appropriate gear and at not over the prescribed speed in engine revolutions per minute.

- In motor marches which contain tanks or combat cars, the pace will be set by a leading vehicle at such a rate as will insure that all tanks or combat cars in the column can keep up without exceeding the prescribed economical speed in engine revolutions.

- When passing through towns and villages, a proper reduction in speed will be directed by the column commander, who should control the march in such manner as to insure the safety of spectators and civilian traffic and to prevent prolonged operation at low speeds in a low gear.

Factors affecting operation. Factors which materially affect the service rendered by motor vehicles should be impressed on all operating and command personnel who are concerned with the supervision, operation, maintenance, and inspection of motor-transport equipment. These factors are:

Proper selection, training, and discipline of operating and maintenance personnel.

Strict supervision and control of operations by commissioned personnel.

Organized maintenance with adequate repair facilities and the performance of routine maintenance and inspection functions.

Serviceable mechanical condition of vehicles.

Recognition of the capabilities and limitations of all types of vehicles in operation.

Careful reconnaissance of routes to be traveled.

Recognition of the capabilities and limitations of the drivers.

Training and experience of the commissioned and noncommissioned personnel.

The necessity for control, for constant and intelligent supervision, and for proper selection, training, and discipline of the operating and maintenance personnel cannot be stressed too forcibly. The discipline required of personnel in organizations operating motor vehicles is that discipline which will guarantee strict adherence to the instructions received in training and will result in the proper operation and maintenance of motor transportation. Selection and training of personnel are covered in subsequent chapters.

Vehicle Units and Assemblies. There are many methods of grouping vehicle units and assemblies, but it is usual to have two primary groupings, the chassis group and the body group. These may be divided into subordinate units, assemblies, and accessories according to functional use, unit or assembly to which attached, or customary automotive practice.

Chassis Group. This primary group consists of the units and assemblies briefly described below under the major assemblies, *running gear*, and *power plant*, with their respective units.

Running gear. This consists of frame, springs, axles, wheels, braking system, and steering mechanism. Some vehicles may also use torque tubes or torque arms and radius rods.

The *frame* is the structural unit about which a motor vehicle is assembled. It maintains proper relation between component parts of the vehicle and distributes the weight to various points of support.

Springs are flat or coiled flexible support units mounted between the frame and axles. They are designed to absorb shocks due to vehicle movement over irregular road surfaces.

Axles may be either dead (nondriving), or live (driving).

The dead axle is usually represented by the solid front axle of a vehicle, all axles of trailers, and the axles of a chain sprocket driven vehicle. This type of axle usually has no moving parts other than those necessary to turn and stop the vehicle.

The live axle contains the final driving mechanism that moves the vehicle. It normally consists of a housing, differential gear, and two axle shafts.

Wheels support the vehicle and are the means for moving it over the highway.

Braking systems are designed either to slow down or to stop a vehicle. When parking brakes are applied they prevent vehicle movement. A vehicle usually has brakes on at least 2 rear and 2 front wheels. However, any combination may be used.

Steering mechanism connects the steering wheel in the operator's cab (or compartment) to the front wheels and provides a means for directing the vehicle.

Torque tubes or torque arms and radius rods may be attached to or made a part of the axle housing and frame or the frame members. They resist the force from propeller (drive) shaft or from any brake action which tends to rotate the axle.

Power plant. This assembly consists of engine assembly, clutch, transmission, and transfer mechanism (the latter usually on heavy duty vehicles), propeller shaft or shafts with universal joint or joints, and differential and final drive units.

Engine assembly is the source of motive power. It converts heat units into mechanical power by the internal combustion of a fuel.

The *clutch unit* engages or disengages the engine from the transmission. When engaging, it permits the load on the engine to be "picked up" gradually. It may also be disengaged so that none of the developed engine power is transmitted to the driving (or live) axles.

Transmission and transfer mechanisms, by use of gear trains, allow the power de-

veloped in the engine to be applied to the driving (live) axles according to the speed, hill-climbing ability, and pulling capacity required.

Propeller shafts are used to transfer power from the transmission to the transfer case and to the driven axles. In order to provide angular (up and down or side) motion of the axle with respect to the frame, one or more universal joints may be used with the shafts. Universal joints are capable of transmitting power through angles within fixed angular limits of the joints.

Differential and final drive units are incorporated in the live axle units and combine to change direction of the power transmission from the propeller shaft to the axle shafts, as well as to adjust the amount of rotation between the right and left wheels on any one driven axle.

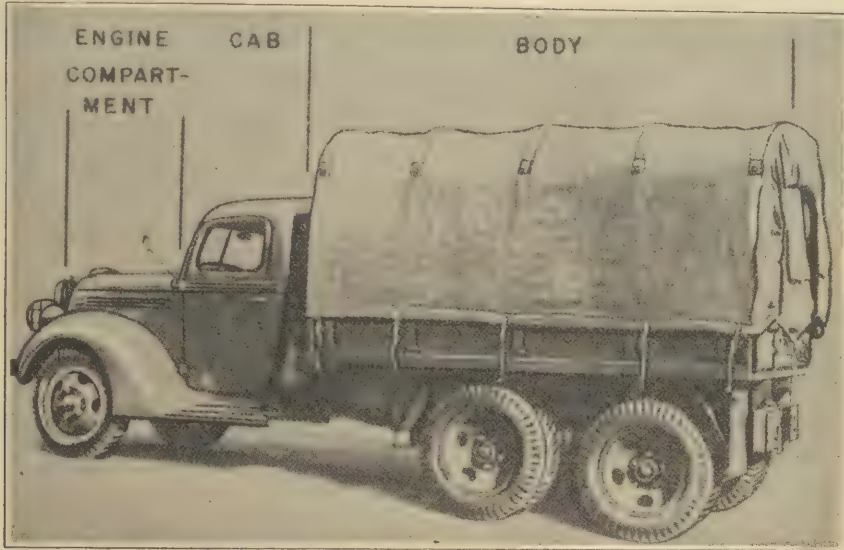


Plate 1. Cargo Vehicle Showing Engine Compartment, Cab and Body.

Body Group. (Plate 1). This primary group consists of the units and assemblies briefly described below.

The *cab assembly* is the compartment usually provided for the driver of the vehicle.

Controls and instruments required for the operation of the vehicle are usually located in the cab and on an instrument panel mounted on the dash.

Cargo body or platform provides space for the payload.

Sheet metal housing (fenders, hood, cowl, and similar metal parts) reduces wind resistance by "streamlining" and protects vital parts from the weather.

Accessories. These are units which, depending upon custom and practice, are not considered necessary for the proper functioning of a unit or assembly but which are often desirable. They usually include oil filters, air filters, and other special equipment.

Electrical System. For convenience, automotive electricity should be considered under the single heading "electrical system", without specific regard to individual units or assemblies with which it functions.

AXLES

Axles. The principle function of the axle is to carry the weight of the vehicle to the wheels. An axle which performs this function only is a dead axle (Plate 2). It may be of tubular or I-beam construction.

Live axles. These axles carry the weight of the vehicle and also transfer power (or driving force) to the wheels. They are of tubular construction. The outer shell carries the weight of the vehicle and forms a housing for the driving axle shaft and the

differential units. In addition to these functions, the outer ends of axles usually carry the fixed parts of the braking system and absorb the forces resulting from brake applications. Front driving axles correspond to rear driving axles except that provision must be made for steering.

Parts. The rear axle assembly consists of the *housing*, the *shafts*, the *bearings*, the *gaskets*, and the *oil retainers*.

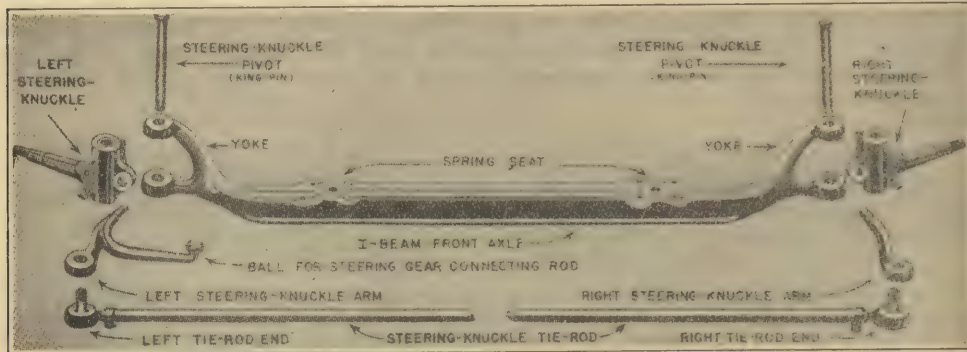


Plate 2. An I Beam Type Front Axle (Dead, Nondriving) and Attached Steering Parts.

The housing is of steel, malleable iron, or aluminum, either forged, pressed, or cast. The housing provides a seat for the other parts of the axle, serves as a container for lubricant, and furnishes brackets for the attachment of springs, shock absorbers, radius or distance rods, brakes, and ride stabilizers. It is subjected to various stresses and strains in the transmission of weight and driving or braking torque.

The axle shafts are steel forgings, the inner ends of which are squared or splined to fit into the side gears of the differential; the outer ends have a means for attaching the wheels.

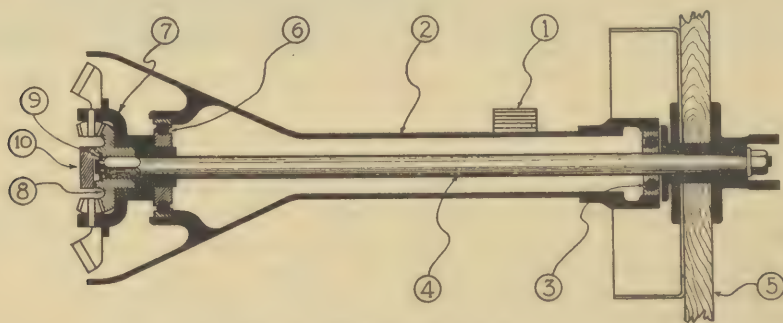


Plate 3. Semifloating Axle.

1. Spring seat.
2. Axle housing.
3. Wheel end bearing.
4. Axle shaft.
5. Wheel spoke.

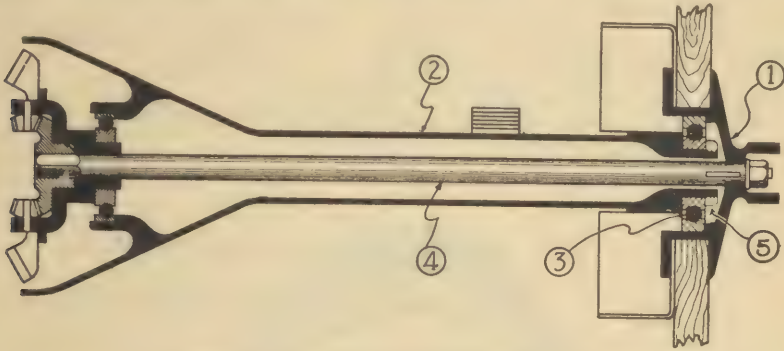
6. Differential bearing.
7. Differential case.
8. Side gear.
9. Axle-shaft retaining "C" ring.
10. Spacer and thrust block.

The gaskets and oil retainers are especially important parts of the rear axle, since they must retain the lubricant and prevent water or dirt reaching the moving parts. Lubricant which escapes at the end of the axle usually ruins the brakes.

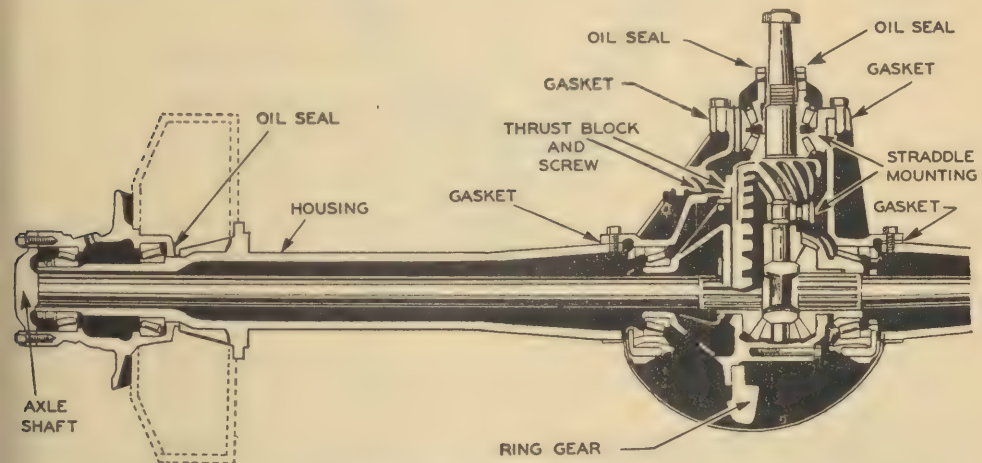
Types. Depending upon the manner in which the above parts and the necessary bearings are assembled to take care of the various stresses, live axles are classified as *plain* and *floating axles*.

The plain live axle is distinguished by the fact that the axle shaft is mounted in bearings within the housing, and the hubs and differential are carried by this shaft. The axle shaft therefore carries weight, is subjected to bending stresses, must deliver driving

Floating axles are classed as *semi-, three-quarter-, and full-floating* axles. In all of them, the differential, rather than the inner end of the axle shaft, is mounted on bearings inside the housing. If the outer end of the axle shaft is mounted in a bearing (Plate 3) and also has the hub mounted only on the shaft, the axle is semifloating. The shaft then carries the load, resists bending, and delivers torque. If the wheel hub is mounted on a radial bearing on the exterior of the axle housing (Plate 4) and is also splined to the shaft, the axle is three-quarter floating. Load is transferred to the housing and then to the hub, but the shaft carries bending and torsional forces. Where the hub is mounted entirely on tapered bearings on the exterior of the axle housing (Plate 5) and the axle shaft merely drives the wheels, the axle is full floating.



1. Hub flange.
2. Axle housing.
3. Bearing (on exterior of housing).
4. Axle shaft.
5. Bearing retaining nut.



Front axles. These axles incorporate a portion of the steering mechanism in addition to carrying the load. In many instances they provide power transmission, especially in tactical vehicles.

Independent springing. Where "knee action" or similar methods of independent springing are used, the center section of the axle, as well as the entire axle structure, is sometimes eliminated. The load is passed from the frame to the wheel spindles by means of two or more flat or coiled springs and transverse linkages.

Shock absorbers. Shock absorbing devices are used to control the action and reaction of the springs between the axles and the sprung load. These may be either single or double acting. The single acting shock absorber acts only on the rebound of the spring, while the double acting acts on both compression and rebound movements. Shock absorbers are normally used on all four wheels of passenger cars, but only on the front wheels of commercial vehicles.

WHEELS, TIRES, BRAKES AND STEERING

Wheels and Tires. The wheels of a motor vehicle must be light, yet strong enough to transmit driving power from the axles to the tires, carry the load, and resist side strains caused by skidding and rapid turning on curves and at corners. Wheels are made of wood, pressed steel, or of cast metal. The hub in the center of a wheel is the means by which the wheel is mounted on the spindle or axle shaft.

Rims secure the tires to the wheels. They are usually of the demountable, quick detachable, or drop center types.

Tires may be either solid, cushion, or pneumatic.

Solid and cushion tires are still used to some extent on motor vehicles. Their principal use is on interior plant vehicles.

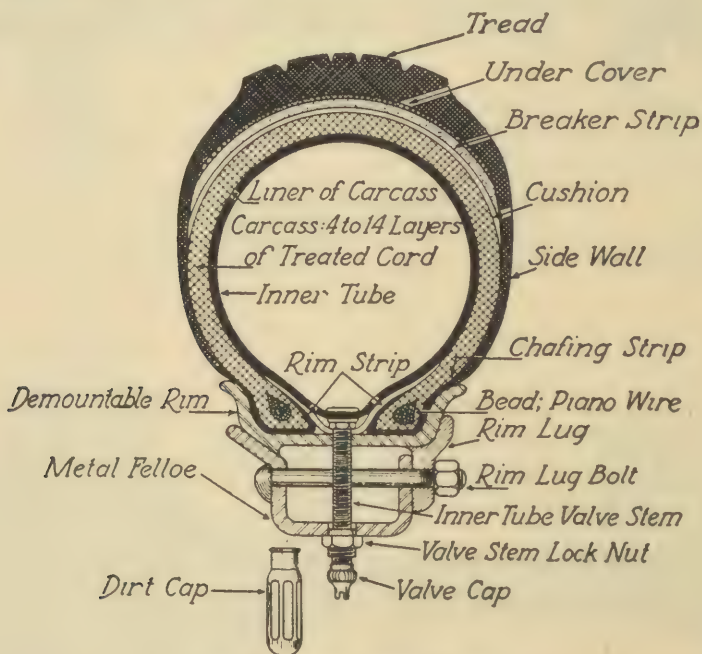


Plate 6. Tire Construction.

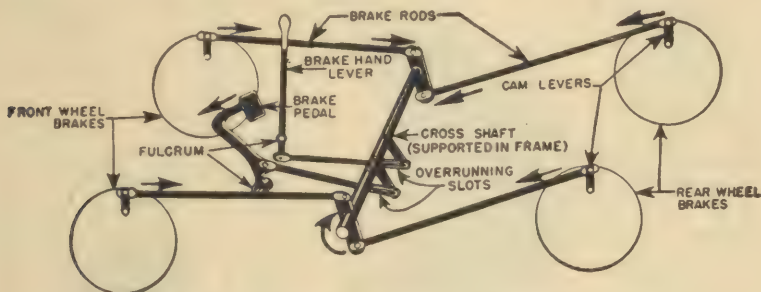
Pneumatic tires are used almost exclusively on modern motor vehicles. (Plate 6). They vary from the wide, thin wall, and low pressure balloon type on passenger cars to the heavy, thick wall, high air-pressure type used on commercial vehicles and heavy trucks. Air is confined to the inside of the tire by an inner tube which, when inflated, conforms to the inside contour of the tire and rim. Puncture resistant tubes have been developed with inner air chambers or layers of special rubber, which seal punctures and control escaping air in case of tire failure. When the traction provided by the regular tread of a tire is not sufficient under certain weather and terrain conditions, chains and mud cleats may be added or the vehicle may use full or half track laying mechanism. (See War Department instructions on detailed care of tires.)

Braking Systems. General. Brakes retard and stop a motor vehicle by acting on the

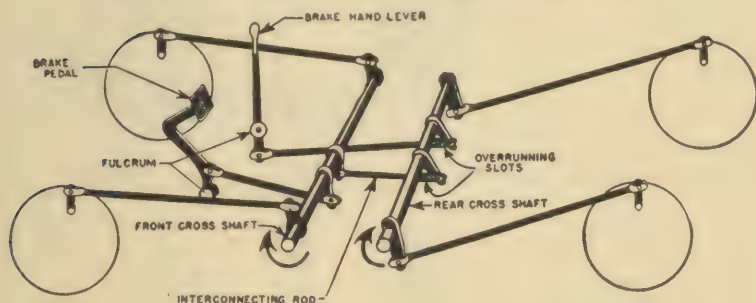
wheels and in some cases on the transmission main shaft.

In order to stop or retard a moving vehicle, friction is developed between the brake drums and brake shoe linings. The heat resulting from the friction is dissipated by air currents that surround the brake drums. The brakes are applied by use of the hand lever or the brake pedal. This forces the brake shoes against the brake drum, and the resulting drag tends to stop the rotation of the wheel.

In a two-wheel braking system the rear wheels only are provided with brakes. In a four-wheel braking system all four wheels are equipped with brakes. The propeller shaft brake is usually known as a hand (or parking) brake.



Mechanical Brake System with Single Cross Shaft.



Mechanical Brake System with Two Cross Shafts.

Plate 7. Linkage and Controls for Mechanical Brake Systems.

Braking action is usually initiated by operation of the foot pedal or hand lever by the driver. The pressure of the driver's foot on the brake pedal moves levers, rods, and cables in mechanical braking systems; a column of liquid (braking fluid) from the master cylinders in hydraulic braking systems; or air pressure from tanks in air-brake systems. Booster devices are frequently used to increase initial braking pressures. Many combinations of braking systems are available. Hydraulic brakes are commonly used on light motor vehicles; air brakes on many heavy duty vehicles. The hand lever usually operates a parking brake.

Brake types based on location and action of the braking surfaces may be classified as external contracting or internal expanding. The contracting type is seldom used as wheel brakes on modern motor vehicles because it is open to dirt and water.

Mechanical brakes employ cables or rods to distribute the braking effort to the wheels. Pressure applied by the operator at the brake pedal is multiplied by the ratio of the lengths of the various brake arms before it is transmitted to the operating shafts. Most mechanical systems equalize the braking action on each wheel by a device known as an equalizing cross shaft or arm. Mechanical brake arrangements are shown in Plate 7.

Hydraulic brakes are extensively used on passenger cars and light or medium weight trucks. Use of the brake pedal develops pressure in a master hydraulic cylinder. By hydraulic principles this pressure is increased and applied to each of the wheel

cylinders through a system of brake tubes. The wheel cylinders are fitted with operating pistons that convert the hydraulic pressure into the mechanical power which expands the brake shoes. As soon as the pedal pressure is released, the return springs of the brake shoe act against the wheel cylinder pistons, forcing the brake fluid back into the master cylinder. Plate 8 shows a hydraulic braking system.

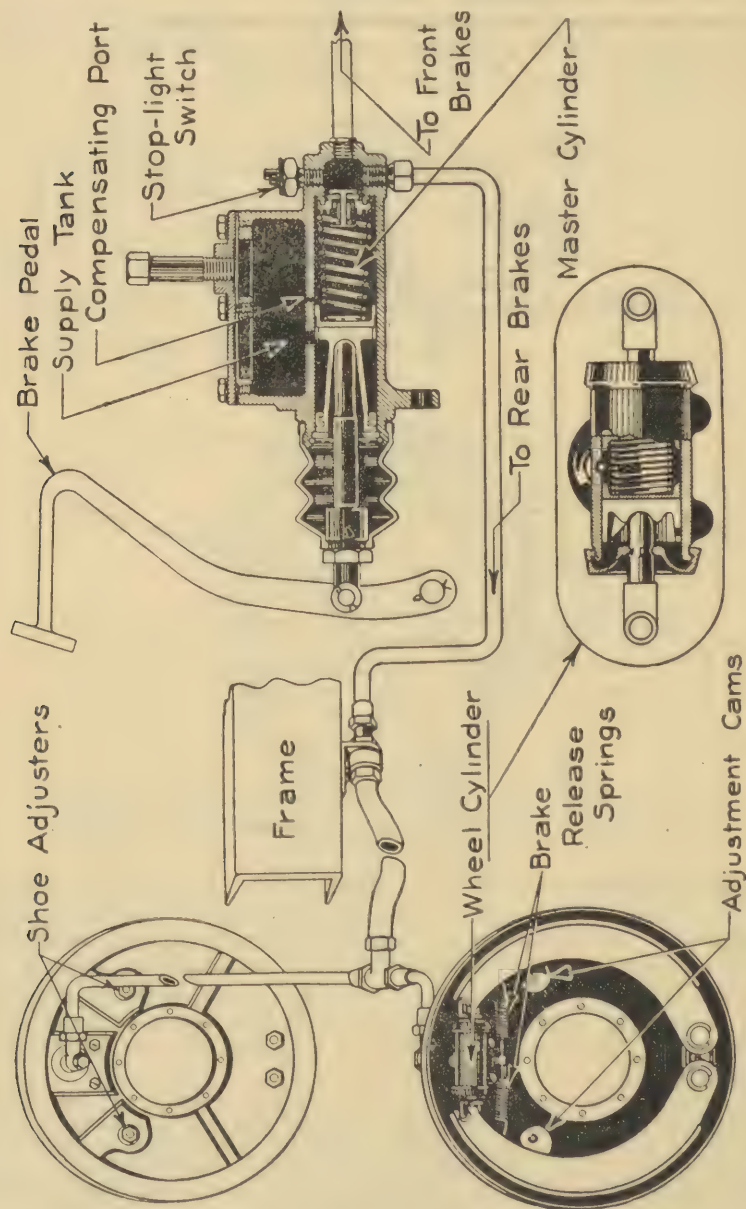


Plate 8. Lockheed Hydraulic Brake System, (Bragg-Kiesrath).

Air brakes are used primarily on buses and heavy-duty trucks. Air pressure for operating an air brake system is supplied by an air compressor equipped with pressure governor (regulator) and driven by the vehicle engine (power plant) or by a separate compressor. Compressed air is stored in a suitable tank (reservoir) equipped with a safety valve. Air is piped from the storage tank to a brake chamber at each wheel through a brake (control) valve. Plate 9 shows an air brake system.

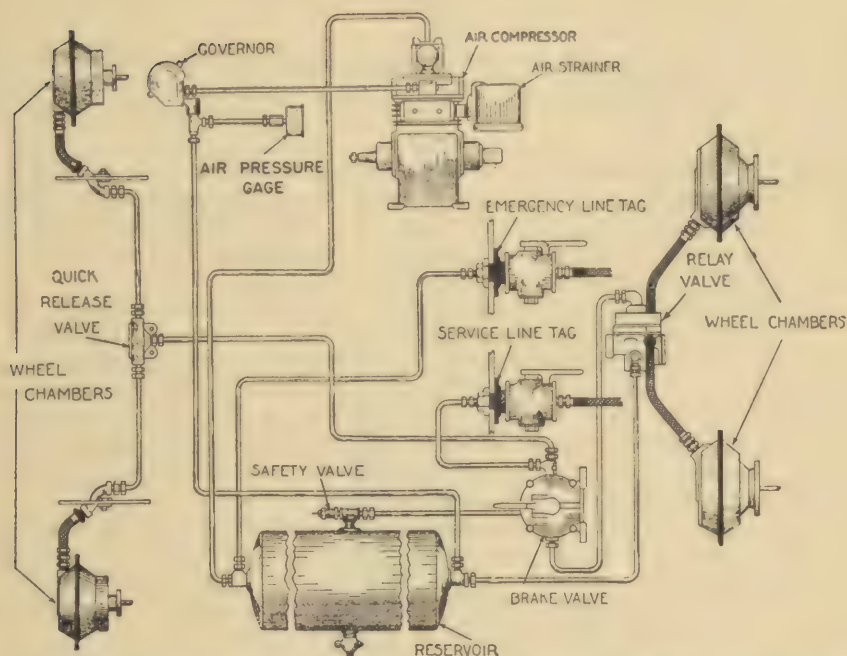


Plate 9. Diagrammatic Arrangement of an Air-operated Braking System.

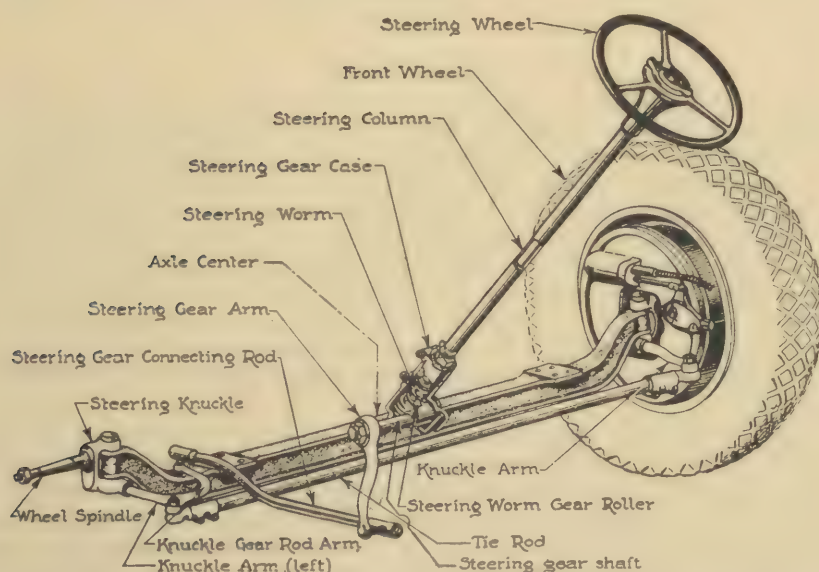


Plate 10. Diagram and Nomenclature of Complete Steering Mechanism.
(Society of Automotive Engineers Nomenclature).

Electrical brakes are suitable for trailers or where remote control installations are needed. Electric brakes depend on the electrical (or a special) system of the vehicle for their operation. They are controlled through a rheostat either operated by hand or synchronized with the foot brake pedal.

Booster systems are often used to assist the operator in applying additional pressure when operating the brake. The commonest of these are the vacuum mechanical, and servo-systems. The servo-system utilizes forces built up in the brake shoe itself to apply additional pressure.

Steering Mechanism. (Plate 10). A motor vehicle is steered by turning both front wheels. The wheels, which are mounted on movable steering knuckles (Plate 2), turn in vertical yokes at the ends of the front axle. The steering knuckles are held in the yokes by steering knuckle pivots (kingpins). The front wheels rotate on bearings which are mounted on the spindles of the steering knuckles.

The steering knuckle pivots (kingpins) are generally set at an angle with the plane of the wheel; this angle is referred to as the pivot (or kingpin) inclination angle. The front axle is rotated backward at the top so that the pivots (or kingpins) have a slight backward tilt; this is the caster angle. The steering knuckle spindles are so adjusted that the front wheels are farther apart at the top than at the bottom; this distance or angle that the wheel leans outward at the top is the camber angle. The tie rod between the steering knuckles is adjusted so that the front wheels are closer together at the front of the wheel than at the rear; this is the toe-in.

This series of angles and their adjustments are called the steering geometry of the vehicle. They must be properly coordinated as designated by the vehicle manufacturer in order to obtain satisfactory steering and control of the vehicle.

The steering knuckles, upon which the wheels are mounted, are connected by means of a tie rod located either in front or behind the axle.

The steering arm on the left knuckle (left hand drive) is connected by a steering gear connecting rod (or drag link) to the steering wheel gear arm (or pitman arm) of the steering gear. The steering wheel, which controls movement of the steering gear, is mounted at the top of the steering post. The steering gear mechanism is carried at the bottom of the steering column. In independent front suspension, modifications of this linkage are generally used.

THE ENGINE

General Principles. The motive power for the modern motor vehicle is usually furnished by an internal combustion engine in which a mixture of fuel and air is burned. The burning fuel-air mixture and the resulting expansion of heated gas and pressures, develops mechanical power by the use of reciprocating and rotating parts, such as pistons, connecting rods, and crankshafts. A *reciprocating engine* is one which converts linear motion into a motion of rotation. This is the most common type both in steam engines and internal combustion engines. The linear motion of a piston in a cylinder, through a connecting rod, causes the rotation of a shaft. The mechanical principle is illustrated in Plate 11. A *stroke* of the piston is a movement from one end of the cylinder to the other. It will be noted that it corresponds to half a turn of the crankshaft. Two strokes of the piston, one in each direction, correspond to one full turn of the shaft.

Four stroke Otto cycle. Any gasoline engine that requires four strokes of the piston, two down and two up (consequently, two complete revolutions of the crankshaft), to complete a cycle of events is called a four stroke cycle engine. Since the four stroke cycle employed in the modern gasoline engine follows closely a thermodynamic principle discovered by Dr. N. A. Otto in 1876, it is referred to as the four stroke Otto cycle.

The fundamental working parts of a four stroke Ottocycle engine and their relation to each other are shown in Plate 12. It is essential that the cylinder be closed at one end and open at the other. The closed end has a threaded opening into which the spark plug is screwed and two openings in which two valves operate to control the intake and exhaust passages of the cylinder. The valves are held closed by valve springs except

when they are forced open mechanically by the valve operating mechanism. A piston is fitted into the cylinder so that it is free to move up and down. Piston rings are fitted into grooves around the piston to form a gastight seal between the piston and the cylinder wall. The open end of the cylinder is mounted directly above the crankshaft. The crankshaft is supported by, and rotates freely in, suitable bearings. In order to convert the reciprocating (up and down) motion of the piston into rotating motion, the piston is connected to the crankshaft by a connecting rod fastened to the piston by the piston pin and to the crankshaft by a split bearing over the crank pin. One end of the crankshaft is ordinarily fitted with a fly wheel to smooth out the power impulses and to continue the rotation of the crankshaft between power impulses. Energy imparted to the flywheel by the power stroke is sufficient to keep it rotating through the exhaust, intake, and compression strokes.

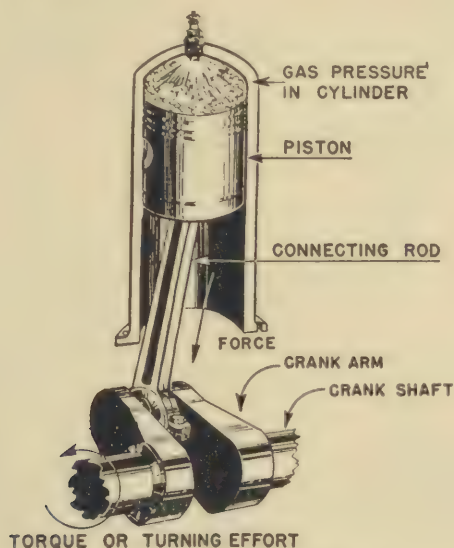


Plate 11. Reciprocating Motion.

The first event in the cycle is the intake stroke, Plate 13. The piston starts from its topmost position or top dead center. With the exhaust valve closed and the intake valve open, the piston moves downward creating a partial vacuum or suction in the cylinder that draws a charge of fuel and air through the intake valve port into the cylinder. As the piston reaches the bottom of its stroke or bottom dead center, the intake valve closes so that the cylinder full of fuel mixture is sealed. Valves are assumed to open and close at top or bottom dead center of the piston for purposes of explanation. The actual points of opening and closing vary widely.

With both valves closed and the cylinder full of fuel mixture, the piston moves upward in the cylinder until it again reaches the topmost position. This event is called the compression stroke, Plate 13. During this stroke the fuel mixture is being constantly compressed into a smaller space in the combustion chamber. Upon completion of this stroke the crankshaft has revolved one complete turn or 360° and the piston has made two strokes, down and up.

At this point in the cycle the highly compressed fuel charge is ignited by the spark plug and combustion takes place. Due to the heat of combustion, the gaseous charge builds up an extremely high pressure and the piston is forced downward to the bottom dead center position. This event is called the power stroke of the engine.

As the piston reaches the bottom dead center position, the exhaust valve opens and the pressure on the piston is immediately relieved. The exhaust valve remains open while the piston again moves upward to the top dead center position forcing the burned

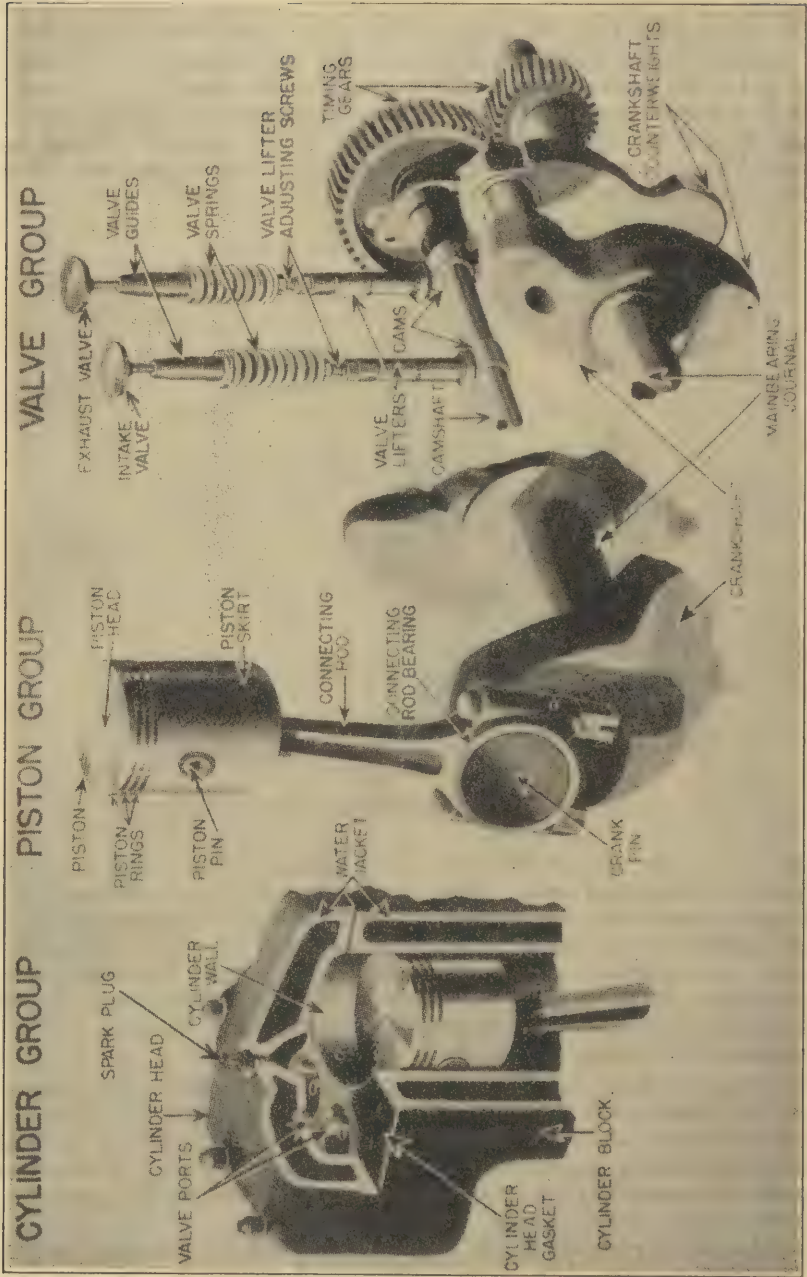


Plate 12. Operating parts of four-stroke Otto cycle engine.

gases out of the cylinder through the exhaust valve port. When the piston reaches the top the exhaust valve closes. This event is called the exhaust stroke of the engine Plate 13. The crankshaft has now made two complete revolutions or 720° of circular movement, and the cylinder begins a new cycle of operation. The camshaft has made only one revolution; the intake and the exhaust valve have each opened and closed only once.

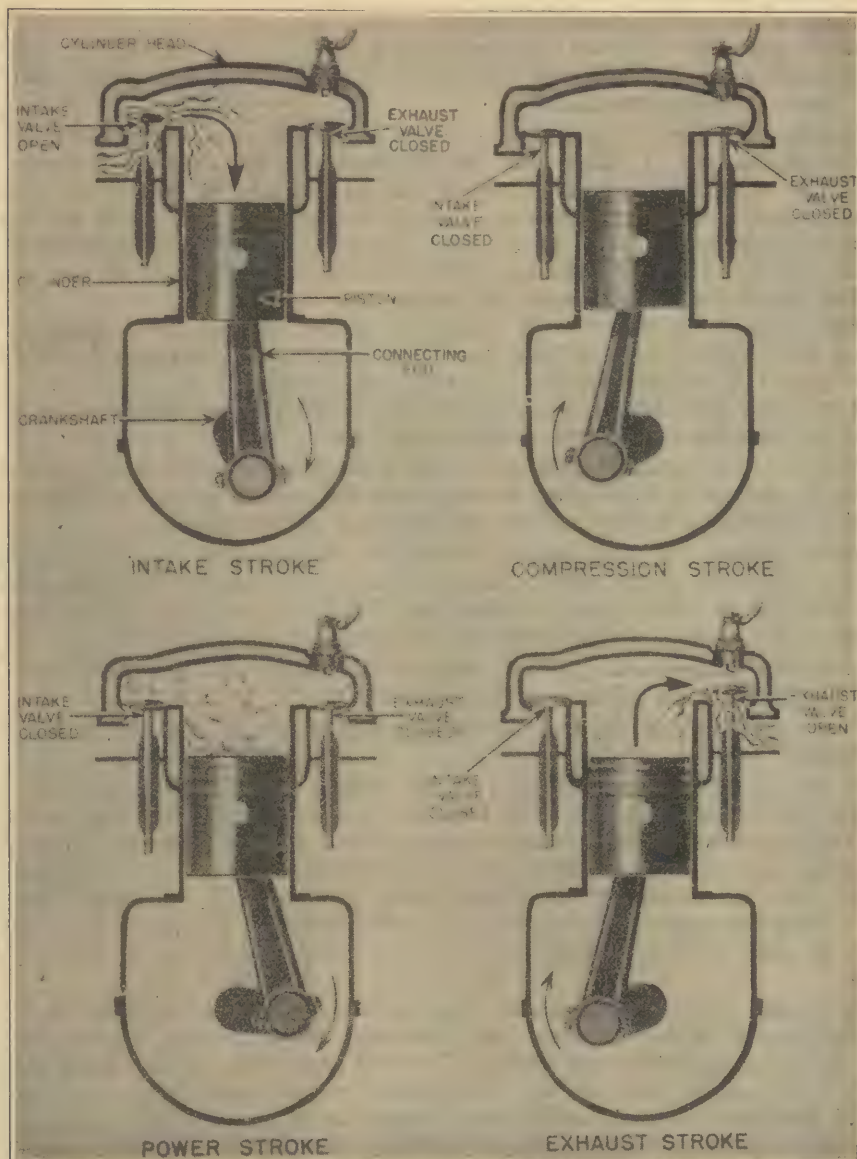


Plate 13. Events of one complete cycle of a four-stroke Otto cycle engine.

This order of events, intake, compression, power, and exhaust, is repeated over and over again as long as the engine operates. Regardless of the number of cylinders any one engine may have, each separate cylinder of the engine follows this cycle of operation in the four stroke Otto cycle.

An engine having only one cylinder would develop power only one fourth of the time. To keep such an engine running during its non-productive strokes the energy

must be stored in a fly wheel or in the momentum of a moving vehicle. A multiple cylinder engine of course provides a more uniform flow of power.

From the above it is evident that to make use of the expansive power of burning gases in an internal-combustion engine:

A combustible mixture of air and gasoline must be introduced into the cylinder, and the cylinder then sealed.

The *charge* of air and gas must be ignited.

The burned gases (the *exhaust*) must be expelled.

There must be a means of repeating these events to produce continuous rotary motion from the power strokes of the piston.

Diesel cycle. The Diesel engine operates on a four-stroke cycle which differs from the gasoline engine cycle. In this engine the first (down) stroke draws in a charge of pure air. The second (up) stroke compresses this air to over 500 pounds per square inch, thus producing a high temperature. Fuel (a low grade of fuel oil or distillate) is injected at the beginning of the third (down) stroke. The high temperature existing within the cylinder causes an immediate ignition of the fuel which forces the piston down. The fourth (up) stroke expels the burned gas.

The semi-Diesel or oil engine is an adaptation of gasoline and Diesel engines. It operates at lower compression pressures than Diesel engines, and consequently the fuel has to be ignited by an electric spark as in the gasoline engine.

Both Diesel and semi-Diesel engines require four events for the completion of each cycle and are manufactured in two- or four-stroke types.

Fuel System. This system supplies the engine with fuel. It necessitates a place for fuel storage, a method of transferring the fuel from the place of storage to the engine, and a means for mixing the fuel with air and feeding it to the cylinder.

Fuel pump method. In most modern vehicles the fuel is transferred from the fuel tank to the engine by a fuel pump. Starting from the storage tank the fuel passes through fuel lines or tubes, through a filter and fuel pump to the carburetor, where it is mixed with air and passed through the inlet port into the cylinder.

Other methods. Gravity, air pressure, and the vacuum are other means utilized to move the liquid fuel from the tank to the carburetor.

Fuel injector method. In the Diesel engine the fuel is sprayed into the cylinder by a fuel injector.

Exhaust System. This system conducts the hot exhaust gases from the engine to the rear of the vehicle and discharges them into the atmosphere after the noise produced by their rapid expansion has been controlled and quieted. Exhaust noises are minimized by piping the gases through a chamber known as the muffler, which to a great extent allows the gases to expand and cool before being discharged. In the older type of mufflers a labyrinth is provided for the gas to pass through. The newer types allow the gases to pass "straight through" as they are cooled and toned by surrounding chambers.

Cooling System. This system includes those units of the vehicle which are used for the specific purpose of carrying away and dissipating the heat from the combustion chamber that is not transferred into power. The metal parts of the engine, which absorb the heat of the burning fuel, not only contract and expand over a wide temperature range, but also have different coefficients of expansion at the same temperature. In order to prevent damage to parts by preignition of the fuel and incorrect working clearances, it is necessary that excessive heat be dissipated.

Water (or other liquid) is the usual agent for cooling engines. It is circulated through a water jacket around the cylinders and combustion chambers and absorbs the heat carried by the metal cylinder head and walls.

The cooling system includes a fan for creating air currents and a water pump for positive and forced circulation of the cooling agent. In most instances a thermostat control device prevents circulation of the liquid until correct operating temperatures have been reached. Plate 14 shows a typical liquid cooling system. The air stream

drawn through the radiator actually cools the liquid during its passage down through the radiator core.

Air, without the use of a liquid as an intermediate agent, cools some engines by being forced in large quantities over the cylinders, which have been provided with metal cooling fins having high heat conductivity.

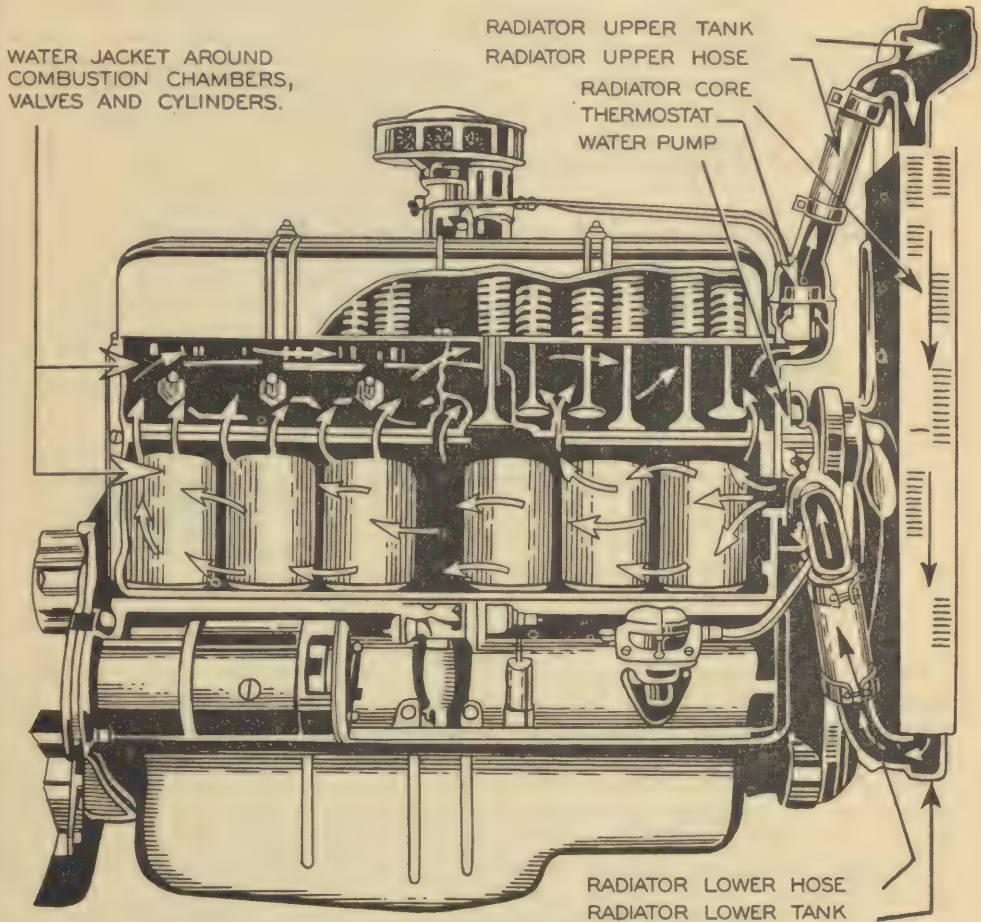


Plate 14. Typical Liquid Cooling System.

Engine Lubrication. Friction in the modern close-fitted, high-speed engine is great and can be controlled only by proper lubrication. An oil-distributing system for engine lubrication is necessary in order to maintain a film of oil on cylinder walls, bearings, and other points where moving parts come in contact. This may be a force feed (pump pressure) type, splash type, or a combination of both.

In the force feed type, oil is pumped under pressure from the crankcase through oil tubes to all crankshaft bearings. In a full force feed system, the oil is pumped to the piston pin through the connecting rods.

In the splash type, oil in the crankcase is splashed and converted into a fine mist by small devices called "dippers" located on the extreme lower end of each connecting rod bearing. Usually the oil is pumped into troughs directly under each connecting rod. The splashed oil settles on all moving parts and lubricates them.

An oil filter is often added to pressure systems to filter all or part of the circulated oil each time it passes through the pump.

Oil coolers are also used on some engines to assist in cooling the lubricant for more efficient lubrication.

A lubricating system of the full force feed type is shown in Plate 15.

Correct engine lubrication is probably the most vital single factor in ensuring longer engine life.

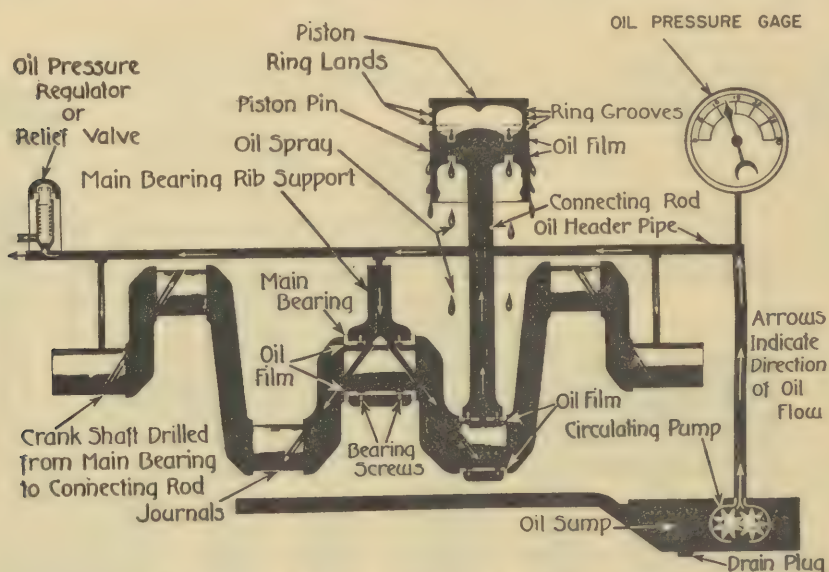


Plate 15. Full Force Feed Lubricating System.

POWER TRANSMISSION

Power Transmission System. (Plate 16.) The power generated by the engine of a motor vehicle is delivered to the driving wheels or tracks through the power transmission system. The clutch, transmission, transfer case, universal joints, propeller shaft, final drives, differential, and axle shafts comprise this system.

Clutch. In order that the operator may control his vehicle properly, it is necessary that he be able at will to connect or disconnect the engine from the propulsion units. This is accomplished by an assembly known as the clutch, Plate 17. When the clutch is engaged, it functions by means of the friction created between its driving and driven members.

The faces of the clutch disk are covered with a friction material similar to woven brake lining. The disk is held between the face of the flywheel and the clutch-pressure plate, which is spring loaded and rotates integrally with the flywheel. Other types of clutches are cone, hydraulic, multiple disk, and single and multiple disk clutches running in oil.

Transmission mechanism. The power requirements of a motor vehicle vary with the speeds of the vehicle, road conditions, and loads. Since an engine develops only a small fraction of its total power at low speed (revolutions per minute), it is necessary for starting and for the lower speeds of vehicle movement to provide a variable gear ratio by sets of different transmission gear combinations. It is common practice to provide at least three forward gear (speed) changes on passenger cars, plus neutral and reverse positions, and as many as five or more forward changes on trucks. A typical transmission case having three speeds forward and one reverse is shown in Plate 18.

The lubricating system of a transmission gear assembly is usually self-contained. The assembly is in a closed case known as the transmission case and runs in a constant bath of oil.

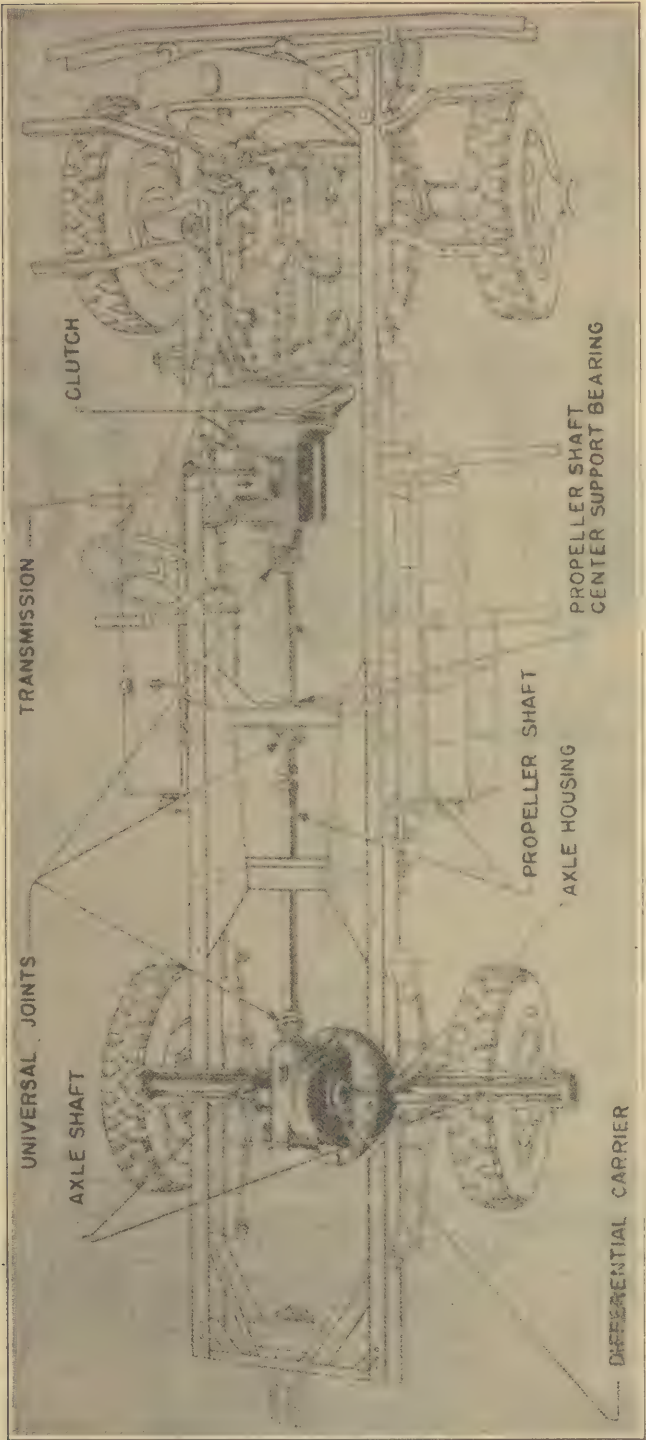


Plate 16. Type of Power Transmission System.

Auxiliary transmission and transfer mechanism (or case). Heavy duty vehicles require a greater selection of gear changes than the transmission normally affords in order to meet power requirements ranging from a no-load condition on level highways to a full-load condition on steep hills or rough terrain. In order to meet these exceptional requirements an extra gear case, usually known as an auxiliary transmission, is used between the regular transmission and the driven axle to provide additional gear changes.

The transfer mechanism (or case), usually located off center with relation to the engine and transmission, provides the means of driving both front and rear axles. A declutching device to disconnect the front driven axle is usually included.

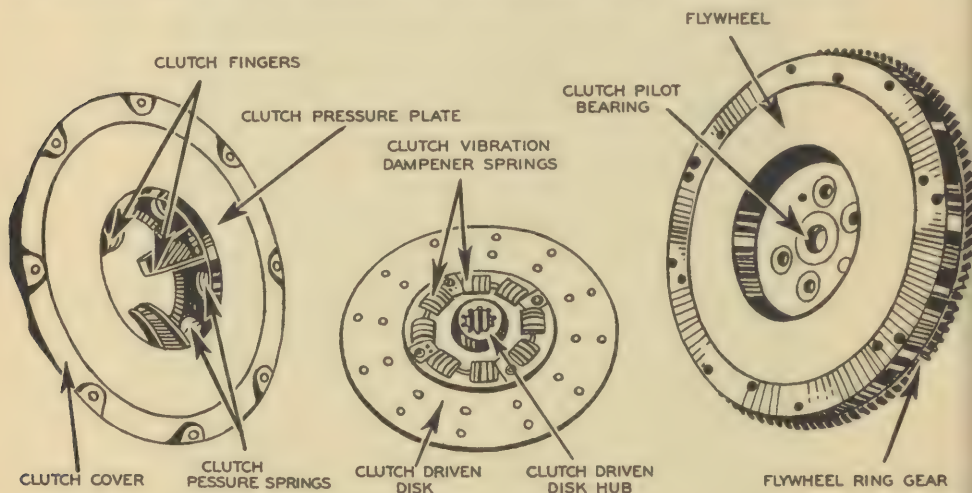


Plate 17. Clutch.

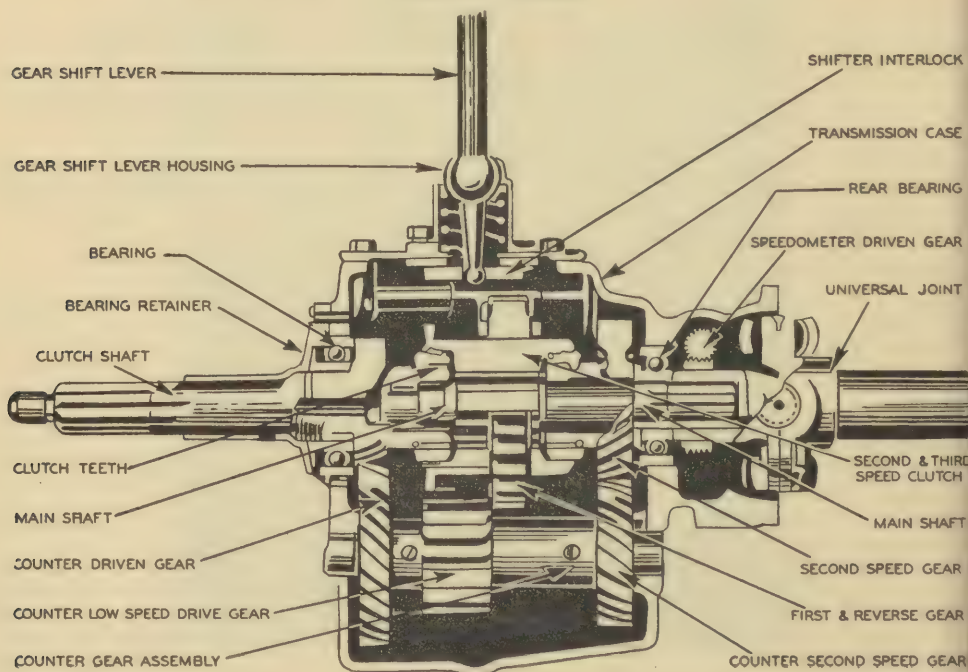


Plate 18. Transmission.

"Power take off" for driving winches, hoists, and similar special equipment may also be included as part of these units.

In all-wheel driven vehicles, the auxiliary transmission (subtransmission) and the transfer mechanism may be combined in one unit. A sectional view of such a unit is shown in Plate 19.

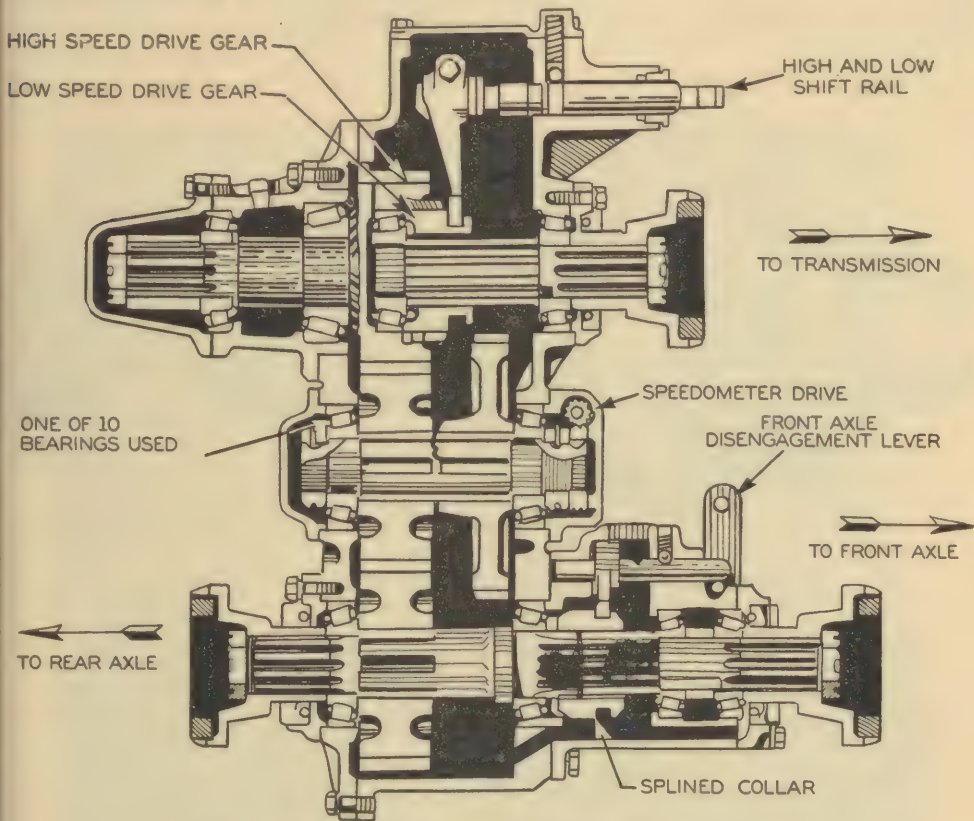


Plate 19. Transmission of All-Wheel Drive Vehicle.

Propeller shaft and universal joint. Power transmission between transmission cases and transfer cases or driven axle units is accomplished through universal joints and propeller shafts. A propeller shaft may be either a shaft running in the open between universal joints or an enclosed shaft (torque tube) type. It must be provided with a sliding or slip joint (spline) and universal joint to overcome the variations in angles and distances between units rigidly mounted in the vehicle frame (transmissions and transfer mechanisms) and units mounted on the driven axle (pinion gears, spur gears, differential, or other final drive mechanism). These variations are caused by the flexing springs under road and weight (load) shocks. Unless provision is made to offset these changes in the location of the driving axle and related units, mechanical or structural failure will result. Plate 20 shows a portion of a propeller shaft, its slip spline, and universal joint.

The ideal power transmission would be in a straight line. The driving axle, however, is generally set somewhat lower than the transmission necessitating that the propeller shaft run down to the axle at an angle. This requires the use of one or more universal joints. A universal joint is substantially a double hinged joint with the pins of the hinges set at right angles. Several different methods are used to achieve this, but in each case, the basic principle is the same.

Final Drives and Differentials. Final drives and differentials are separate and distinct mechanisms, each serving a different purpose. A final drive transmits power from the propeller shaft to the differential case and changes the direction of the power transmitted by the propeller shaft through 90° to the driving axles. At the same time it provides a fixed reduction between the speed of the propeller shaft and the axle driving the wheels. A differential is a device which allows torque to be delivered to two shafts or wheels which may be turning at different speeds.

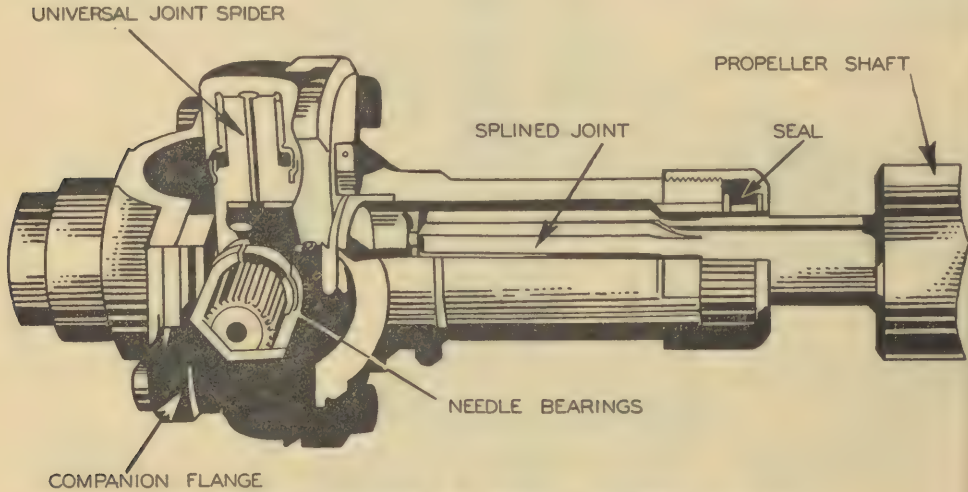


Plate 20. Propeller Shaft, Slip Spline and Universal Joint.

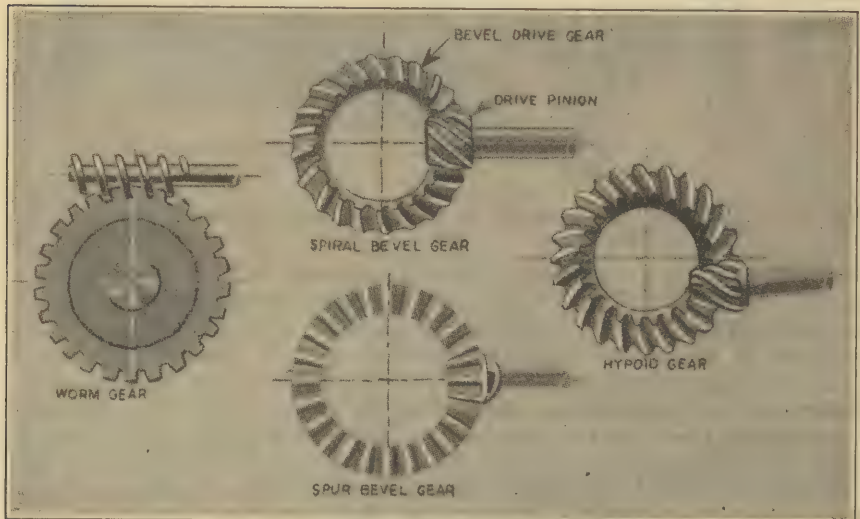


Plate 21. Gears Used in Final Drivers.

Final Drives. General. Torque from the transmission is transmitted longitudinally along the chassis by means of the propeller shafts. At the axle the direction of this force must be changed through a right angle to rotate the wheels. This is done by the final drive, which also provides an additional gear reduction. There are three general types of final drive: The *bevel gear*, the *worm gear*, and the *hypoid gear*.

Bevel gear final drives (Plate 21) invariably use spiral-bevel gears to secure quiet

operation and long wear. The drive pinion is built integral with either a short pinion shaft or with the propeller shaft.

Worm gear final drives (Plate 21) are used on many trucks, since they permit the use of high reduction ratios.

In a hypoid gear (Plate 21) the axis of the pinion gear is either above or below the center line of the bevel gear. Its principal advantages are greater tooth area in contact, quieter operation, and increased chassis clearance above the propeller shaft. This increased clearance permits construction of vehicles with chassis closer to the ground.

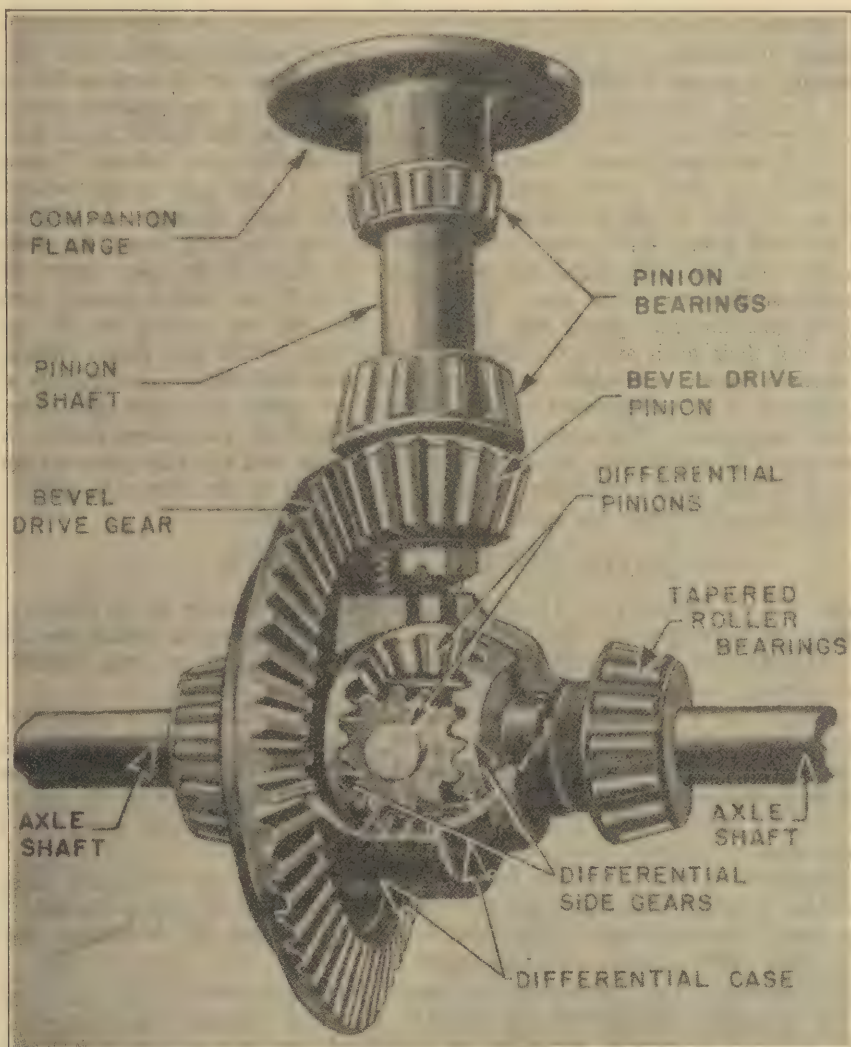


Plate 22. Differential with Part of Case Cut Away.

Differentials. When a column of marching men turns a corner, the man in the inside file must take short steps, almost marking time, while the man in the outside file must take long steps and walk a much greater distance to make the turn. When a motor vehicle turns a corner, the wheels on the outside of the turn must rotate faster and travel a greater distance than the wheels on the inside. This causes no difficulty with the front wheels of the usual passenger car which are not driven because each

rotates independently of the other on opposite ends of a dead axle or on independent spindles (knee action). In order for the rear wheels to turn at different speeds, however, their individual axle shafts must be connected to the bevel drive gear in such a way that each shaft can turn at a different rate of speed and still be driven as a single unit. This is the function of the differential. The type of differential in general use (Plate 22) consists of a differential case bolted or riveted to the bevel drive gear, and two or more differential pinions pivoted radially in the case and meshed with two differential side gears. These are splined to the two axle shafts which drive the wheels. The axle shafts pass through each side of the differential case but rotate independently of it. Spur bevel gears are almost always used for the differential pinions and side gears. Usually, either two or four differential pinions are employed.

An actual differential, with the parts in their proper relative positions but without their housing, is shown in Plate 22. The differential pinions are pivoted on the trunnions of a spider. These trunnions extend outward beyond the pinions and their outer ends are held in recesses between the two parts of the case which holds the side gears in mesh with the pinions. The action of the differential is as follows: The drive pinion rotates the bevel drive gear and the differential case and spider which are attached to it. The power is transmitted to the axle shafts through the differential pinions and side gears. When there is equal resistance on each rear wheel, the differential pinions rotate the differential side gears and axle shafts at the same speed which is the speed of the bevel drive gear. In this case, there is no relative motion between the pinions and the side gears; that is, the pinions are not turning on the spider trunnions and their teeth are not moving over the teeth of the side gears. When the vehicle turns a corner, one wheel must turn faster than the other. Consequently there is a movement of the differential pinions around the spider trunnions and over the teeth of the side gears. This makes one side gear, axle shaft, and wheel revolve faster than the other. Any movement of the differential pinions over the side gears accelerates one axle shaft and retards the other. The average speed of the two side gears, axle shafts, and wheels is always the speed of the bevel drive gear.

BODIES AND ELECTRICAL SYSTEM

Bodies. Vehicle bodies (Plate 1) must afford comfort and safety to the operator and passengers. In passenger cars the body must also help support or stiffen the frame. Bodies are composite or all metal. However, composite bodies of steel, wood, and fabric are being rapidly replaced by all-steel bodies.

The complete body assembly of a truck is considered as two distinct parts: the cab or operator's compartment and the cargo body. In panel delivery bodies the cab and cargo body are usually separated by a panel or wall. In many of the larger type trucks used for long distance highway hauling, space is provided for a bed in the operator's cab for a relief driver. This is usually found in the wheeled tractor type unit used for trailer work.

The instrument panel, across the front, of the cab within easy reach and vision of the operator, contains operating gages and instruments as well as engine controls.

Many special types of cargo bodies have been produced, but the commonest are the platform, stake, panel, cargo, and tank types.

Electrical System. Any electrical unit of automotive equipment on the motor vehicle should be considered as part of the complete electrical system. This equipment is generally grouped by circuits according to functional use: storage battery; generating and lighting; ignition; starting motor; horn; protective devices; and miscellaneous, such as lamps, switches, and special devices. A typical wiring diagram of these circuits is shown in Plate 23.

Storage battery. This unit may be considered the heart of the electrical system of a motor vehicle. It furnishes electrical energy for cranking the engine and also for the electrical units of the vehicle when the generator output is insufficient. It is charged by any excess current from the generator. A wet cell battery of the lead acid type has an inherent potential of approximately 2 volts per cell. Thus a 6-volt system will

use a 3-cell battery composed of 3 individual cells in series mounted together in a container and connected as a single unit. A sectional view of a lead acid storage battery cell is shown in Plate 24.

Generator. A direct current generator with related control mechanism is usually attached to the engine of practically all motor vehicles in order to generate and supply electric current necessary to maintain the battery in a charged or nearly charged condition; otherwise, the battery would soon become discharged. The generator may be of 2- or 4-pole construction and may be driven by belt, chain, or direct gear drive. High current generators of the voltage regulated type are becoming more common because the modern motor vehicle requires a greater amount of current.

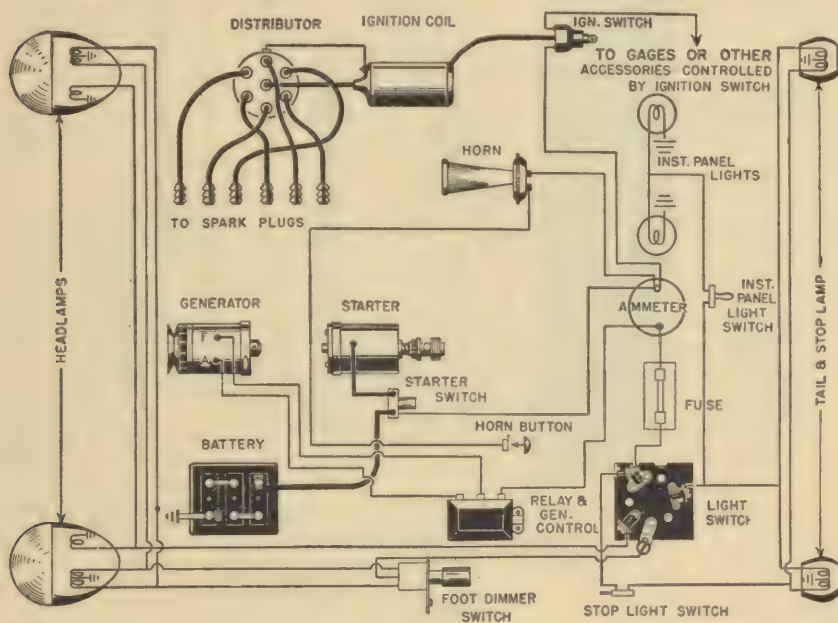


Plate 23. Wiring Diagram of Car Showing Principal Units and Circuits.

Lighting circuits. These circuits include head lamps, tail lamps, stop lamps, and any instrument lamps necessary for the night operation of the motor vehicle. Light switches are usually considered with the circuit of the lamp or lamps which they control.

Ignition system. In the gasoline engine the charge of compressed fuel is ignited by an electric spark. This ignition spark is created and controlled by an ignition system composed of the battery ignition switch, coil, condenser, breaker (interrupter), distributor, spark plugs, and the necessary wire to connect them. A typical battery ignition circuit is shown in Plate 25.

The magneto is another type of ignition system frequently used. It is self-contained, as the current that is ordinarily supplied by the battery (in a battery ignition system) is generated within the magneto. Plate 26 shows a typical magneto circuit.

Starting motor. Electric motors with high torque characteristics are used almost universally for cranking the engines of motor vehicles. The starting motor may drive the engine by a silent chain and overrunning clutch, or by a pinion gear attached to the motor armature shaft, which is brought into mesh with teeth cut on the rim of the engine flywheel. However, the pinion method is used almost exclusively. The pinion gear is engaged with the flywheel either by being shifted along the armature shaft by a combined shifting yoke and switch operating mechanism or by being run into mesh along a screw shaft through a driving spring as the armature picks up speed.

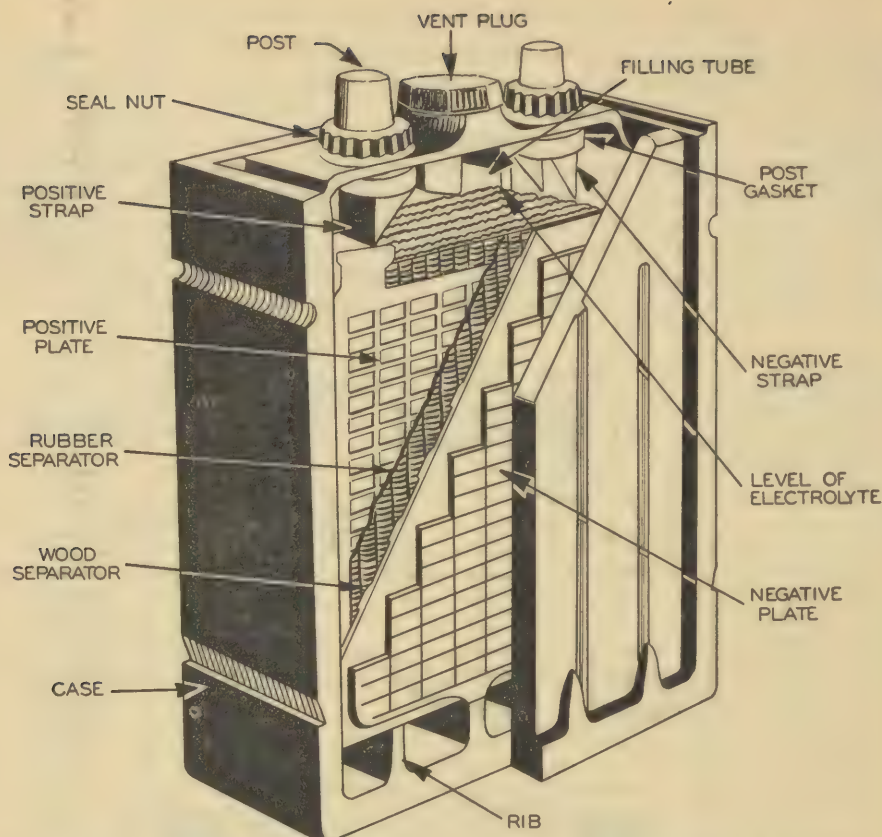


Plate 24. One Cell of Lead Acid Storage Battery Showing Relationship of Plates, Insulators, and Terminals.

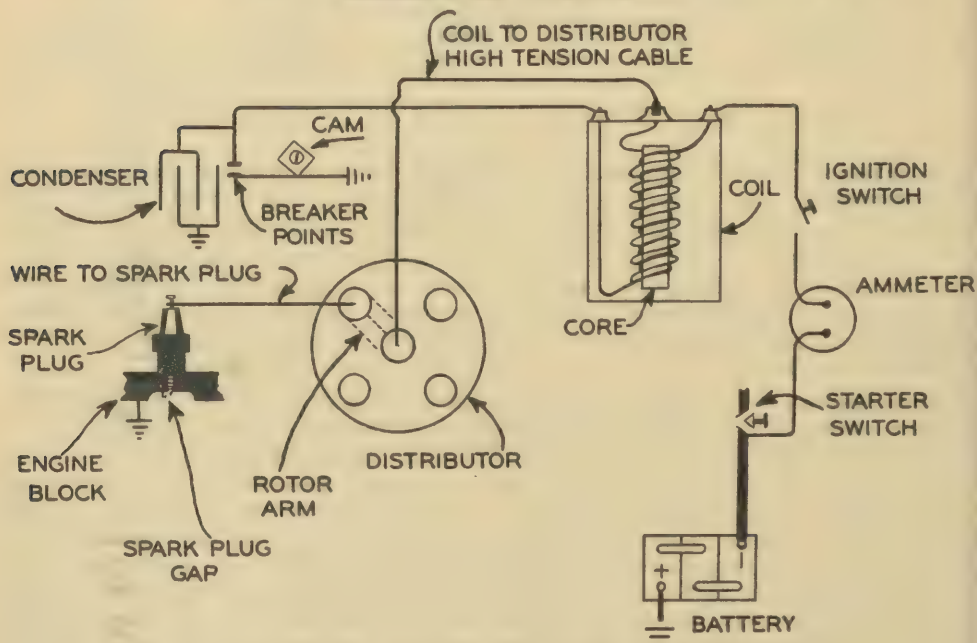


Plate 25. A Typical Battery Ignition Circuit.

The latter type is known as a Bendix drive. This type of drive assembled on a starting motor shaft is shown in Plate 27.

Horns. Horns or warning devices on motor vehicles are normally operated by electricity. Usually they consist of an electromagnet equipped with an interrupter device and arranged in such a way that the electromagnet vibrates a thin metal diaphragm. A projector or bell placed over the diaphragm amplifies the sound and directs it forward.

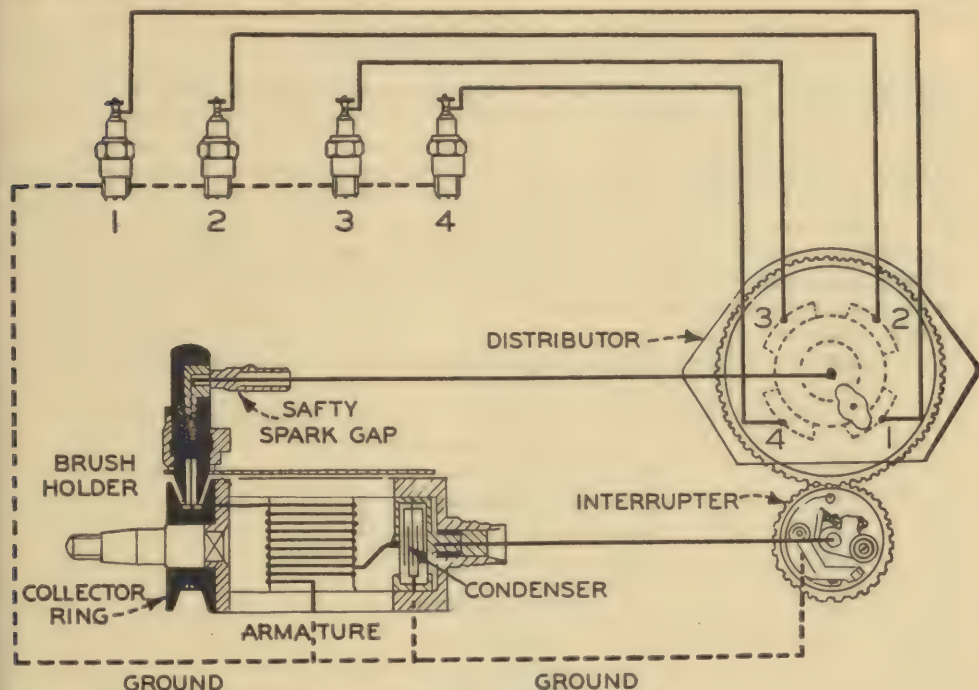


Plate 26. Typical Magneto Circuit.

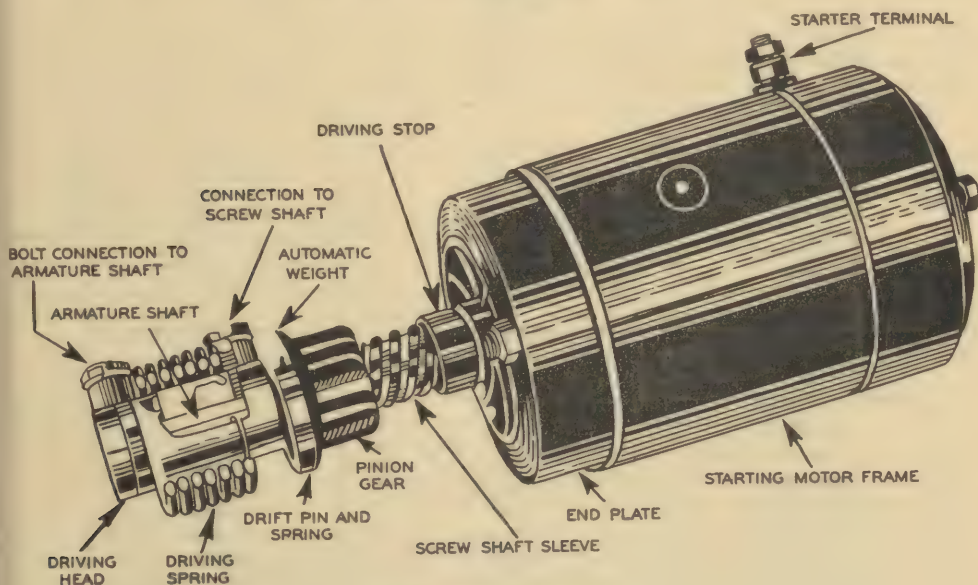


Plate 27. Bendix Drive.

Protective devices. Devices such as fuses or magnetic circuit breakers are placed in the electrical circuits of the motor vehicle to protect the wiring and battery from overloads or short circuits. Too heavy a current will melt the fuse and open the circuit or will separate (open) the points of the circuit breaker.

Miscellaneous. This group includes lamps, fuel gages, turn indicators, and other electrical accessories, or special devices operating from the motor vehicle electrical system.

AUTOMOTIVE MAINTENANCE

Basic Principles. The Army system of automotive maintenance is based on:

Scheduled preventive maintenance operations, unit replacements, repairs, and inspections with the primary objective of economical uninterrupted vehicle service.

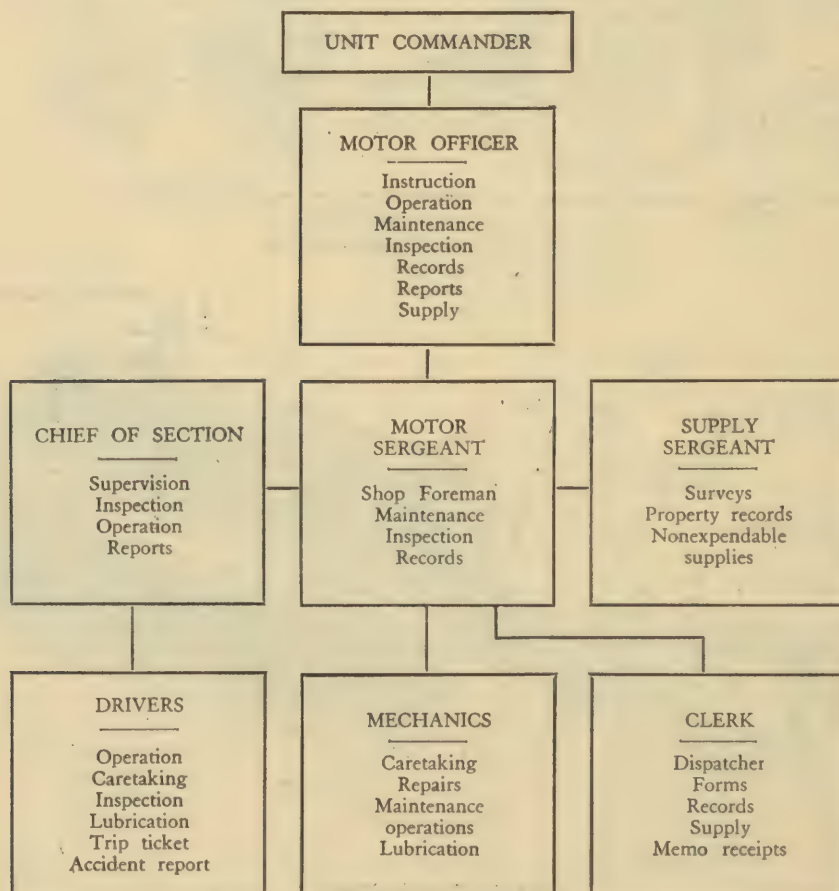
Systematic detection and correction of incipient causes of vehicle failures before they occur and the operations necessary to maintain satisfactory day-to-day operation.

The principle of unit replacement rather than major repair of a unit while installed in the vehicle is practiced in all cases where such assembly is available.

Within the motor maintenance system of operating organizations will be included only the tools, equipment, and personnel which are necessary to insure combat efficiency. It will be predicated upon:

Close and adequate support by the supply service motor maintenance units.

ORGANIZATION WITHIN THE COMPANY OR BATTERY FOR SECOND ECHELON MAINTENANCE



Meeting the normal needs of operation (not the unusual needs).

Minimum decentralization within the regiment.

The expectation of a certain proportion of motor-vehicle casualties. The available elements essential to maintenance will determine in each case whether these casualties will be repaired by the organization or by the supporting service.

Replacement of vehicles which cannot be repaired within the time element in the particular situation.

The Echelon System of Maintenance. There are, in general, four divisions of Army maintenance called the first, second, third, and fourth echelons (AR 850-15).

Responsibility. The first and second echelons of maintenance are the responsibility of the using arms and services, while the third and fourth echelons are the responsibility of the supply services.

Essential elements. There are four elements essential to maintenance functions: personnel, equipment, supplies, and time. The work to be performed in the various echelons is limited by restrictions of one or more of these elements.

Functioning. The succeeding paragraphs of this chapter are devoted to the detailed functioning of the first and second echelons and to a broad presentation of the third and fourth echelons.

First Echelon—Driver and Assistant Driver. The first echelon maintenance is drivers' maintenance. It covers the simple operations that can be trusted to the skill of the average driver using tools and supplies available on the vehicle. These operations may include: drivers' inspections; servicing (replenishment of gasoline, oil, water, antifreeze, and air); cleaning, lubrication, except items requiring special lubricants, equipment, or technical knowledge; tightening or replacement of nuts, bolts, screws, and studs; preparation of the vehicle for maintenance operations and for command and technical inspections; and care of tools and equipment of the vehicle to include the storage battery.

Second Echelon. The second echelon maintenance is that maintenance other than first echelon maintenance performed by the using arms and services. It embraces preventive maintenance, minor repairs, unit replacements and inspections within the limits of time available. When vehicles are pooled or are in one special organization, the first and all the second echelon functions are combined. On the other hand when a company or battery of a regiment has vehicles assigned to it, the second echelon functions are usually divided between the company or battery and the regiment. The organization to which the vehicles are assigned is responsible for first echelon maintenance and certain portions of the second echelon, limited as hereafter provided, by the tools, light portable equipment, parts, and mechanics authorized. The regiment, on the other hand, with its separate maintenance section, performs the operations requiring either more skill or special tools.

Company or battery. Unit commander. The unit commander is directly responsible for the first and part of or all the second echelon maintenance. He normally has the assistance of a motor officer, a motor sergeant, and motor mechanics. In order to insure a high state of operating efficiency the unit commander must—

Separate, as far as possible, the operating and maintenance functions of his personnel and establish definite responsibility for each function.

Establish and maintain uniformly high standards for all work.

Make vehicles and time available for maintenance operations.

Enforce a simple but thorough method of record keeping.

Conduct schools to insure uniform training of drivers (see Chapters XIII and XIV) and mechanics, and to supply replacements for personnel losses.

Provide necessary lubrication, maintenance, and inspection guides.

Establish and enforce routine scheduled maintenance operations.

Make such inspections as are necessary to insure the proper coordination and functioning of all personnel.

Maintenance is a function of command. Continued successful operation by a motorized unit requires that the personnel in command positions give to the activities of maintenance the time and effort necessary to meet the needs of operation.

Motor officer. The motor officer should be selected from those officers having either special motor training or aptitude. He should be familiar with all the peculiarities of his vehicles and should be able to inform his seniors at any time of the exact condition of each vehicle. He is responsible to his immediate commander for the technical operation and maintenance of the vehicles. His duties include—

- Organizing and supervising the maintenance, repair, and servicing of vehicles.

- Instructing the drivers and assistants until they are fully qualified.

- Being in charge of all caretaking.

- Inspecting before leaving park, on the road, at the halt, at the end of the march, inspecting vehicles in storage; and making maintenance inspections.

- Assisting in making command inspections.

- Seeing that all parts and supplies are procured.

- Routing vehicles to a higher echelon.

- Supervising the keeping of forms and records.

- Instructing all maintenance personnel in their duties.

- Spot checking all maintenance operations.

- Carefully watching the lubrication services and checking the lubricants for type and condition.

- Having all fire hazards removed.

- Observing the drivers whenever practical.

- Directing the transfer of loads in case of break-down.

- Giving proper instruction in case any personnel is left behind on a march.

- Giving proper instructions to expedite any road repair or rescue.

- Riding usually at the tail of the column.

Motor sergeant. The motor sergeant should be selected for his knowledge, mechanical skill, and his aptitude for organization and supervision. He allots the work to mechanics and inspects their work both during the actual performance and when the job is completed. He should be well versed in quickly and accurately diagnosing mechanical failures and should be able to give the mechanics proper instructions for corrective action. He should be trained in field expedients and should be able to get the vehicles through when stalled or in bad going. He should be present with the vehicles from the time of the arrival of the first driver until the last vehicle is in, and he should remain with them until they are all ready to operate again. His duties include:

- Principal assistant to motor officer.

- Direct charge of the park.

- Directing the work of mechanics and, if so assigned, the drivers.

- Closely supervising and checking the work of mechanics in scheduled maintenance.

- Assisting, as directed, in inspections.

- Observing operation of vehicles on the march, and supervising road adjustments, repairs, and rescues of stalled vehicles.

- Personally checking or designating a mechanic to check all vehicles immediately upon any halt and upon completion of the day's march. Particular attention is paid to excessively heated parts, such as gears and brakes.

- Reporting evidences of neglect, abuse, or carelessness to the motor officer.

- Keeping or supervising the keeping of the record of repairs, adjustments fuel, and supplies.

- Supervising starting of engines to see that they start promptly and are warmed up properly.

- Riding usually at the tail of the column.

Chiefs of sections. Chiefs of section direct the march of their sections and require drivers to comply with instructions as to gear, speed, distances, safety, and similar matters. Their duties include:

- Responsibility for and directing caretaking by drivers.

- Reporting vehicle troubles and faults to the motor sergeant.

- Responsibility for the replenishment of gasoline, oil, water, and other operating supplies.

- Riding usually in the first vehicle of the section.

Mechanics. The number of mechanics allotted to the various units is given in the Tables of Organization. It is based on the number of vehicles to be maintained. Mechanics make repairs and adjustments under the direction of the motor sergeant. They perform the operations of scheduled maintenance, assist chiefs of section in care-taking when so detailed, and observe vehicles on the march. One mechanic usually rides with the motor officer and the others ride in the unit repair truck.

Tools and equipment. The Tables of Basic Allowances prescribe the tools and equipment. For each general automobile mechanic the allowance is one set of hand tools consisting of about fifty items. In addition to the tool sets of the mechanics, the motorized battery, company, or similar unit is allowed a "unit equipment set." A "mechanic's truck" or repair truck is usually allotted to each unit for carrying mechanics, tools and equipment and parts and operating supplies.

Spare parts and supplies. In order to prevent the dissipation of spare units and parts, the stock is generally limited to that required for the discharge of necessary maintenance functions.

Regiment. In most arms and services there is provided by the Tables of Organization a regimental second echelon maintenance organization. The personnel are a part of the headquarters company battery, or like unit of the regiment and are administered by the commanding officer of that unit. The regimental commander is directly responsible for the operation of the regimental second echelon.

Regimental motor officer. The regimental motor officer must be a highly trained full-time motor officer to command the motor-maintenance personnel and supervise its functions. His duties include:

- Being in charge of the regimental motor maintenance section or platoon.

- Coordinating and consolidating all requests for third echelon repairs. Cooperating with third echelon shops on requirements for repairs.

- Supervising replacements and maintenance operations.

- Making maintenance inspections as required.

- Supervising the keeping of motor-vehicle operation and maintenance records.

- Coordinating and consolidating all requisitions for motor transport parts and supplies, other than those handled by the unit supply officer.

- Supervising the supply and issue of motor transport supplies within the regiment, other than those handled by the unit supply officer.

- Keeping a record of expenditure of funds allotted.

- Checking upon the units to prevent the hoarding of parts and supplies to the detriment of other units.

- Prorating the budget allowance in money value for cleaning and preserving material and parts, as directed by regimental commander.

- Keeping in touch with all maintenance establishments that operate with the organization.

- Preparing all records and reports in regard to motor transportation required to be forwarded to higher headquarters.

- Supervising the unit motor schools.

- Keeping in touch with the utilization and circulation of vehicles of the units.

- Assisting the commanding officer in making command inspections.

- Notifying all organizations of the location of his repair facilities in the field.

- Riding at the tail of the column, ordinarily allowing none to fall behind him, except those vehicles beyond repair. In time of peace he makes suitable arrangements for repair or salvage of vehicles so damaged that towing is not practicable.

- Examining driver candidates, and keeping record of and issuing W. D., Q. M. C. Form No. 228 (U. S. Army Motor Vehicle Operator's Permit), in accordance with AR 850-15.

- Preparing scheduled maintenance guides for the various units under his technical supervision, as well as for the regimental maintenance section's operation.

- Keeping unit commanders informed as to the efficiency of maintenance of their motor vehicles.

Insuring that information issued in technical service bulletins or regulations reaches all maintenance personnel in the regiment.

Making frequent visits to the unit motor maintenance personnel to render such assistance and advice as may be needed.

Regimental motor sergeant. The regimental motor sergeant is the principal assistant of the regimental motor officer. He is in direct charge of the mechanics and assigns and supervises their work. He coordinates the duties of the supply personnel with those of the maintenance personnel. He prepares the maintenance records and reports required. In the absence of the regimental motor officer, he takes over his duties, establishes the maintenance set-up in the field, and notifies all organizations of his location.

Regimental motor mechanics. The regimental motor mechanics should be among the best qualified mechanics in the regiment, thus making the services of the best mechanics available to all units.

Regimental supply officer. The regimental supply officer is directly charged with the procurement and issue of fuel, lubricants, antifreeze solutions, cleaning and preserving materials, and similar items directly to the operating units. He should utilize the services of the regimental motor officer in preparing recommendations as to the quantity and quality of operating supplies and the quantity of maintenance supplies. The duties of the regimental motor officer in no way change the duties and responsibilities of the regimental supply officer.

Spare parts and supplies. The bulk of the spare units, parts, and supplies for the entire regiment is carried in the regimental section or platoon. This prevents dissipation of the stock available and yet allows any portion of it to be readily available to the organizations. Ordinarily an unserviceable unit is replaced by a spare unit, if one is available, and the damaged unit is then returned by the regiment to the third echelon for exchange.

Third Echelon. Third echelon maintenance is that normally performed in the field by quartermaster and ordnance personnel. It embraces principally the replacement of unserviceable unit assemblies by similar unit assemblies held in third echelon stock. In addition to unit replacement, the third echelon supports and extends maintenance facilities to the using arms and services by making repairs involving the use of medium mobile shop equipment and by the services of general mechanics and a limited number of trade specialists; by the supply of unit assemblies and parts to the second echelon; and by the evacuation to the third and fourth echelon shops of vehicles which require repairs beyond the scope of second and third echelon facilities.

Fourth Echelon. The fourth echelon maintenance is that normally performed in the rear areas by the quartermaster or ordnance personnel. It embraces the tear-down and repair of any or all unit assemblies which are used in the motor vehicles of the command to which the fourth echelon shop is assigned. Essentially this consists of major unit repair. It also includes salvage and reclamation service.

MAINTENANCE OPERATIONS

Definitions. *Repairs.* Repair consists of adjusting, tightening, replacing, or reconditioning any part, subassembly, or assembly of a motor vehicle.

Adjustments. Adjustment consists of placing parts, subassemblies, or assemblies in correct working relation to each other and securing them in that position.

Tightening. Tightening consists of drawing up nuts and screws where adjustment is not involved. This is usually the duty of the driver; therefore, a clear distinction should be made between tightening and adjusting. The latter requires knowledge, experience, and often special tools and is usually performed by fully qualified repair personnel.

Replacing. Replacing consists of exchanging any part, subassembly, or assembly, and placing them in proper adjustment.

Reconditioning. Reconditioning consist of restoring any part, subassembly, or assembly to a state of serviceability.

Scheduled Operations. In order to maintain the vehicles in as near perfect operating condition as possible, scheduled maintenance operations followed by maintenance in-

pections are necessary. These should be positive operations performed in accordance with a definite schedule based on time, mileage, or a combination of both. This schedule must be planned well in advance and coordinated with anticipated demands for vehicles. Scheduled maintenance operations for all vehicles, except those special purpose and combat vehicles for which maintenance operations are prescribed in service manuals and handbooks, are divided into five general classifications as follows:

Daily. Daily maintenance consists of cleaning, servicing, tightening, and emergency repairs. Cleaning, servicing, and tightening are duties of the driver under the direct supervision of the chief of section and under the technical supervision of the motor maintenance personnel.

Weekly. Weekly maintenance is a continuation and a check of the drivers' daily maintenance. It will be performed at least once each week by the driver under the direct supervision of the chief of section and under the technical supervision of the motor maintenance personnel.

Lubrication. Lubrication operations should be performed by designated personnel in accordance with a lubrication guide furnished with each type of vehicle. This guide represents the minimum requirements and must be increased to meet severe operating conditions.

Monthly (1000-mile). This maintenance operation is normally performed by the company, battery, or similar unit mechanics under the supervision of the motor sergeant. A record is made to show the defects that could not be corrected, the time of accomplishment, the mechanic who performed the operation, and the officer who made the maintenance inspection. This record should be retained until the semiannual (6000-mile) maintenance operations and technical inspection, at which time it may be disposed of as the unit commander sees fit. Pertinent data from the record are entered in the vehicle service record. A guide for this maintenance, which should be modified as necessary for a particular type of vehicle, follows. Tolerances and clearances might well be added. Items marked with an asterisk (*) may require tools and parts not available or authorized, in which case the defect should be corrected by the next higher echelon:

Road test.

Bring engine to operating temperature and examine for smoke or fumes. Examine condition of oil on measuring stick. Observe any evidences of blow-by or leaks.

Test horns, lights, windshield wiper, and other safety devices.

Drive vehicles.

Test for proper steering.

Observe engine for power delivery, acceleration, and unusual noises.

Test clutch action. Stop and investigate unusual noises.

Test gear sets and final drives for ease of shifting and unusual noises.

Test brakes for equalization, stopping distance, pedal travel, and pedal "feel."

Observe action of instruments on dash.

Observe the final drive and power transmission units while another person drives or while the vehicle is blocked up with the wheels off the floor. Note any overheating of units.

Check lubrication levels after return to motor park.

Maintenance operations, general.

Clean and tighten storage battery, terminals, and carrier bolts. Test battery and refill to proper level.

Tighten body bolts, fenders, running boards, splash pan joints, bumpers, brush guards, head lamp brackets, mirrors, tow hooks, pintles, body parts, radiator shell, and hardware.

*Repair body injuries.

Replace unserviceable instruments or safety devices.

Adjust lights.

Wheels, brakes, and springs.

*Replace worn brake lining.

Correct overlubrication or leakage of lubricant.

Remove looseness or bind from wheel bearings.

Tighten wheel stud nuts.

Correct any leaks in hydraulic or air brake system.

Fill master cylinder to proper level.

Centralize and adjust brakes.

Replace unserviceable shock absorbers and linkage; replenish fluid.

Repair broken or loose spring hold-down bolts, rebound clips, and center bolts.

Tighten loose shackle bolts.

Correct any malfunctioning of the brake system.

Steering mechanism.

Remove by adjustment or repair any excessive play in:

Steering knuckle bearings.

Tie rod ends.

*Bushings.

King pin wedge bolts.

Drag link or connecting link.

Pittman arm or sector shaft.

Steering gear.

Tighten attachment of steering mechanism to frame, and of steering column to body.

Replace any excessively worn or bent parts.

Tighten, replace, or properly secure all lock washers, cotter keys, nuts, and similar items.

Adjust wheel stops when turning radius is incorrect. (Note any wear on drag link.)

Lubricate entire mechanism while front wheels are off the floor. Turn wheels from side to side to insure distribution of lubricant and to ascertain whether or not the entire mechanism works freely.

Driving axles.

Tighten loose driving flange nuts and cap screws.

Tighten and properly secure all assembly, pinion carrier, cover plate, spring seat, and other bolts and nuts.

*Correct any leakage of lubricant.

*Remove any excessive play or backlash.

Clutch, transmission, transfer case, propeller shafts, and universal joints.

Adjust incorrect clutch free travel and floor clearance.

*Repair defective reverse shifter stop, and malfunctioning shifter mechanisms.

Tighten all loose bolts and nuts, assembly support, carrier, and cover plate.

*Correct any leakage of lubricant.

Correct misalignment of universal joints.

*Repair all fractures.

*Replace excessively worn spline and universal joints.

*Repair all evidences of slackness, looseness, or leakage.

Open clutch housing drain vent.

Repair or replace muffler or tail pipe.

Cooling system.

Tighten radiator supports, braces, and attachment of shell to core.

Adjust fit of hood on shell and fit of hood locks.

Replace unserviceable hose and hose clamps.

*Correct all evidences of water leakage.

Adjust incorrect fan-belt tension; replace unserviceable fan belt.

Fuel system.

Clean dirty sediment bowls.

*Correct any leakage in or around the fuel pump.

Tighten connections; repair or replace leaking lines.

*Correct any malfunctioning of fuel pump.

Engine.

Service all air filters; replace oil filter if required.

Tighten engine mountings, flywheel housing, oil pan, flywheel cover, timing-case cover, manifolds, accessory attachments, and other bolts and nuts.

* Correct all breakage, cracks, or leaks.

Set manifold heat valve to seasonal adjustment.

* Repair unserviceable breaker points.

Replace all damaged wiring.

* Correct malfunctioning generator or starter.

* Correct generator output.

Adjust noisy valves.

* If on the road test any missing occurs, the entire ignition system should be carefully checked and spark plugs removed, examined, cleaned, reset, and serviceable ones re-installed.

* Remove causes of other knocks, noises, and unsatisfactory engine performance.

(Vacuum gauge is valuable for diagnosis of troubles).

Repair looseness in any controls.

Road test. Check repairs.

Record. Prepare a record as follows:

Defects not corrected.

Unit

Defect

.....
.....
.....

Mechanic's and motor sergeant's certificate.

I have performed the maintenance operations as outlined in the guide for monthly (1000-mile) maintenance operations, and so far as can be determined this vehicle can be expected to give 30 days, or 1000 miles, of satisfactory service, except as indicated under defects.

Date Signature Signature
(Mechanic) (Motor sergeant)

Maintenance inspection certificate.

I certify that I have performed the maintenance inspection on this vehicle as required by AR 850-15 and that it can be expected to give 30 days or 1000 miles of satisfactory service.

Date Signature
(Motor officer)

Semiannual (6000-mile) maintenance operations. These maintenance operations are normally performed by the regimental second echelon of maintenance. Under extremely severe operating conditions certain items may have to be checked every two or three months. An instructional guide similar to that used for the monthly (1000-mile) maintenance operations should be drawn up. These maintenance operations differ from the monthly operations in that all accessory units and some other parts are disassembled, cleaned, inspected, and lubricated. They are then repaired or exchanged if necessary. Semiannual (6000-mile) maintenance operations are thus more complete than are those performed monthly or every 1000 miles, and should assure reasonable vehicle service if the monthly (1000-mile) maintenance operations are carefully performed. If a shop card is not made out to show the repairs, the mechanic, the items not corrected, and the completion of the inspection, a record similar to that used in conjunction with the monthly (1000-mile) maintenance operations should be prepared and retained until after the technical inspection. Maintenance operations that should normally be included in the 6-month (6000-mile) service are:

Records to include inspection of vehicle repair and operating records for the past six months (6000 miles), followed by a road test similar to the monthly (1000-mile) maintenance.

Engine tune-up to include check of oil and air filters, a vacuum and compression test, cleaning of oil pan and interior of engine, adjustment of valves, adjustment of spark plugs, reconditioning of ignition wiring, generator servicing, starter servicing,

ignition servicing, carburetor servicing, and check of tightness and serviceability of all parts and accessories.

Fuel system to include examination and servicing of fuel pump, gas lines, carburetor, and tank.

Cooling system to include radiator service and check of thermostat, fan belt, and water pump.

Instruments and electrical systems to include check, service, or replacement of horn, lights, wiring, windshield wiper, and dash instruments.

Clutch, transmission, and transfer case to include clutch travel and floor clearance, reverse shifter stop, transmission and transfer case supports, grease seals, tightness, and lubrication.

Propeller shafts and universal joints to include slackness, free movement of spline joints, grease seals, and lubrication.

Driving axles to include back lash, inspection, lubrication, and adjustment of wheel bearings, spring clips, spring hold-down bolts, spring shackles, driving flanges, leaks, grease seals, and lubrication.

Steering mechanism to include attachment of steering mechanism and column, pitman arm, play in steering mechanism, steering linkage, steering stops, turning angle of front-drive axle, and lubrication.

Front end to include spring hold-down bolts, rebound clips, shackles, shock absorbers, lubrication and adjustment of wheel bearings, tie rods, and tires for wear and alinement.

Wheels and brakes to include hub bolts, grease seals, brake lining, brake linkage and and lines, and brake cylinders.

General to include storage battery, body and attachments, curtains, muffler, and tail pipe.

Engine check by bringing engine up to operating temperature and checking results of engine tune-up for quietness; idling speed; acceleration; and leaks in carburetor, fuel pump, gas lines, cooling system, oil pressure lines, and oil seals.

Road test.

Record of operation.

New Vehicles. During the break-in period, new vehicles usually require special maintenance operations. War Department instructions, if issued for the particular vehicle, and the manufacturer's recommendations should be followed. Prior to operating the vehicle and again at the end of the break-in-period, a complete mechanical inspection is made. All shortages, defective parts, and malfunctions are entered on the inspection report and action taken to replace or correct them.

Company or Battery and Regimental Second Echelon Repairs. The following examples do not indicate all the operations performed but show some of the common ones. Circular 1-10, OQMG, covers the operations in detail for the entire second echelon.

Company or battery. Adjustments. Wheel bearings, pedal clearances, steering gear and linkage, fan belt, water pump, spring shackles, and lights.

Replacements. Carburetor, generator, distributor cap and rotor, fuel pumps, batteries and cables, manifolds, instruments and switches, oil lines and filters, and brake shoes.

Regiment. Adjustments. Steering geometry, voltage regulator, carburetors, generators, valve tappets, and timing.

Replacements. Tie rods, distributor points, valve springs, carburetors, thermostats, fuel pump diaphragm, and governors.

MARCH MAINTENANCE

General. Maintenance while on a march presents special problems, although, in general, the principles already described apply. The speed maintained, especially on long marches, causes disabled vehicles to become separated from their units by considerable distances in a very short time. This must be considered in making decisions concerning the vehicles and any personnel left with them, especially on sections of road which will soon pass to the control of other units. Personnel and maintenance facilities may

become so far separated from their respective units as to endanger their return. Because of the unpredictable nature of marches near the enemy, every opportunity for motor maintenance should be used, even if it is impossible to complete the work at one time.

Maintenance Personnel. Where marches of tactical units are involved, each organization will have the maintenance personnel allowed by Tables of Organization, and possibly some attached third echelon personnel. Maintenance personnel of batteries, companies, or similar units normally ride at the tail of their respective units, while the regimental motor maintenance personnel ride at the tail of the regiment.

Repair Procedure. During marches, roadside repairs to disabled vehicles are frequently temporary in character. The necessity of keeping the vehicles under control often requires hasty repairs sufficient only to complete the trip. Upon reaching its destination, the vehicle should be repaired properly. When a vehicle drops out of its battery, company, or similar unit, the maintenance personnel at the tail of the unit attempt to diagnose the trouble quickly.

If the diagnosis shows that the vehicle needs a minor repair only, a mechanic with a kit of tools and spare parts is dropped off with the vehicle. In all cases where the vehicle is towing a gun or transporting troops its tactical cargo or tow is removed and loaded or attached to another vehicle. The driver always remains with the vehicle unless ordered by competent authority to abandon it. When a vehicle drops out, it is driven, pushed, or towed off and well to the right of the road, so that other vehicles may pass around without halting. If the vehicle is repaired by the mechanic who was dropped off, it resumes the march at the maximum authorized speed to rejoin the rear of the last unit that has passed. It does not take its customary place in column but remains at the rear of the first unit ahead until the next halt. If march orders so permit, it then doubles the column and proceeds to its organization. If the mechanic is unable to make the repair, the vehicle is either repaired or towed by the regimental motor-maintenance platoon joining up the rear of the column.

If the mechanical crew of the battery, company, or similar unit decides that immediate repair is not possible, the vehicle may be towed and repairs made later, or it may be abandoned to regimental motor maintenance or to a higher echelon. The decision in all cases is made by the motor officer, or, in his absence, by the motor sergeant. When repair personnel are working by the side of the road, warning guards, signs, or flags must be put out unless the vehicle is completely off the road. At night, red lanterns should be utilized. Whenever a battery, company, or similar unit maintenance crew stops to diagnose the trouble of a vehicle that has fallen out, care must be exercised that the whole crew does not become separated from its organization. If such were the case, the unit would have no maintenance personnel with it to care for the remaining vehicles of the organization. Maintenance personnel should always be with the organization when it arrives in bivouac, to assist in the inspection, repair, and servicing of the organization vehicles.

Towing Disabled Vehicles. Arrangements in any column for towing disabled vehicles will depend upon the type of vehicle, road conditions, type of march, and other considerations. Certain vehicles may march at the tail of the column for this particular purpose. Some vehicle or vehicles near the rear of each organization should be designated as towing vehicles, if vehicles for that particular purpose are not available, so that when a vehicle falls out a towing vehicle near the rear will halt to tow it if towing is required. Such an arrangement prevents confusion and possible loss of a vehicle for the lack of a towing vehicle. These towing vehicles should be provided with tow bars, tow ropes, or tow chains.

Abandoning Vehicles. When vehicles on the march become disabled and for some reason are not towed or are not capable of being towed with vehicles within the organization, they may be abandoned either temporarily or permanently.

When the abandonment is temporary, the driver and possibly a mechanic are left with the vehicle. In the combat zone consideration must be given to the possibility of not recovering the personnel and facilities thus detached. If a gun prime mover fails, the gun should be coupled to any available vehicle and accompany its organization.

Every effort should be made to remove to other vehicles all essential combat equipment prior to abandonment of the vehicle. A driver left with a vehicle awaiting maintenance or salvage personnel should be given explicit orders concerning the removal of the load.

If the abandonment is permanent, the proper steps should be taken to comply with orders covering such action. Vehicles should be tagged to show the reason of their unserviceability. In time of active operations, supply services will provide measures making it convenient to turn over to them any disabled vehicles. When vehicles are left for the disposition of the supply services, the commander should make arrangements for replacements as soon as possible. When operating units abandon vehicles, the supply service concerned must be furnished accurate reports as soon as practicable of the location and general condition of such vehicles.

In all cases when a disabled vehicle constitutes a road obstruction it will be removed from the road.

LUBRICATION

General. Lubrication is one of the most important duties charged to personnel of organizations operating motor vehicles. It is an essential part of preventive maintenance; to a great extent it determines serviceability of parts and assemblies; it materially influences repair and operation costs; and it is one of the most important factors affecting dependable mobility and useful vehicle life. Training, supervision, supplies, and equipment are required for the performance of correct lubrication.

Correct lubrication provides and maintains under all conditions of operation a suitable oil film between friction surfaces where necessary.

Methods. Lubrication operations may be decentralized or centralized. In either case the unit commander assigns definite responsibility for these functions. The motor officer, assisted by the motor sergeant, prepares lubrication schedules, supervises lubrication, and makes frequent inspections to assure himself that all vehicles are properly lubricated. Good teamwork must be developed if the desired results are to be accomplished.

Decentralized lubrication. This method is particularly applicable to field service operations, and will give excellent results when personnel are properly trained and supervised and lubrication schedules are carefully followed. Responsibility is divided as follows:

The driver performs the prescribed driver's lubrication functions.

The mechanics perform special lubrication to include gear cases, steering gear housing, wheel bearings, universal joints, starting motor, generator, distributor, clutch release bearing, water pump, fan, air cleaner, and changes of crankcase oil.

Chiefs of sections or truck masters are charged with direct supervision of driver lubrication. They should make frequent inspections to insure correct lubrication in accordance with the lubrication schedule.

Centralized lubrication. When this method is employed, all lubricating functions are carried on at a central point and drivers are relieved of all responsibility for lubrication except the replenishment of crankcase oil. When centralized lubrication is applied to a small fleet, responsibility for correct lubrication should be charged to one qualified individual; when the fleet is too large to be lubricated correctly by one individual, assistants should be provided and definite responsibilities should be assigned to each. Vehicles should be sent to the central station when lubrication is required, and should be accompanied by the driver. The driver's services should be utilized to expedite the work. Centralized lubrication is not recommended for field service operations.

When motor vehicles are detached from their organizations for such periods of time that they will miss their scheduled lubrication service, provision should be made for the performance of the lubrication functions. This should be accomplished in one of the following ways:

Send qualified personnel and the necessary supplies and equipment with the vehicles. Arrange for the vehicles to be lubricated by other units.

Provide the necessary supplies and equipment, and direct the driver to perform the lubrication.

Schedules. Lubrication schedules should be prepared for each make of vehicle assigned to an operating unit.

Lubrication periods recommended by the manufacturer are generally too infrequent to provide correct lubrication for military motor vehicles and should be modified to meet operating conditions. In general, the chassis and slow-motion parts should be lubricated after every 7 days or 50 hours of vehicle operation; the crankcase oil should be checked frequently and changed after 500 to 1000 miles of operation, especially if operated for considerable periods across country or in low gear. The gear lubricants should be checked weekly and changed seasonally, unless operating mileage requires more frequent changes.

Records. A complete record of lubrication should be kept. Responsible personnel should report when lubrication duties have been completed in order that proper entries may be made.

Lubricants. General. Lubricants used on military motor vehicles should conform to the recommendations of vehicle manufacturers or of the supply services concerned. During field service it may be impossible to supply a complete assortment of lubricants which meet the above recommendations and it will be necessary to make the best use of those available.

Types and uses. Correct lubrication of motor vehicles requires the use of several types of lubricants and the application of each type in accordance with a lubrication schedule. Types of lubricants and their general uses are as follows:

Lubricating oils. Lubricating oils used on military motor vehicles are exclusively mineral oils obtained by distilling crude petroleum oils. In general, oils are employed to lubricate engine bearings; starting motors; generators; slow-moving surfaces such as brake pedal pivots and brake linkage, door hinges, and locks; some fan bearings; some water pumps; and some transmissions. Different makes of oils should not be mixed.

Gear lubricants. Gear lubricants are heavy bodied oils, pure mineral oil or pure mineral oil to which materials have been added, used for the lubrication of parts where a strong oil film is required. In general, they are employed for the lubrication of final drives and differentials, transmissions, auxiliary transmissions, transfers, steering gear housings, some wheel bearings, and some universal joints.

Greases. Greases are usually made by compounding mineral oil with a soap. The load-carrying properties of greases, except graphite grease, are determined by the oil used in compounding the grease. Greases are used to lubricate surfaces where pure mineral oil or gear lubricants cannot be retained.

Miscellaneous lubricants and fluids. Spring lubricant. Graphite grease, a mixture of grease and graphite, is generally used for the lubrication of spring leaves. It is not to be used for general lubrication purposes.

Penetrating oil. This oil is used principally to get into places that have become very dry or rusty, such as brake linkage and nuts or bolts that cannot be loosened or tightened with a reasonable amount of force.

Petrolatum or vaseline. Petrolatum or vaseline is used to coat battery terminals and connections to reduce corrosion. It is also used to lubricate the fiber block on the movable breaker point arm in the distributor housing.

Kerosene. Kerosene may be used to thin engine lubricating oil in very cold weather. Approved recommendations should be followed closely when it is necessary to resort to this practice.

Cleaning solvent. Cleaning solvent is a compound fluid used for washing engines, parts, and assemblies. It is not highly inflammable; however, it should be employed with caution when used for cleaning hot engines. When cleaning solvent is not available kerosene may be used. Gasoline must never be used.

Alcohol. Hydraulic-brake parts should be cleaned with denatured alcohol. Gasoline, kerosene, cleaning solvents, and oils are harmful to these parts and must not be used for this cleaning.

Means of Application. Lubricants are applied to the motor vehicle by employing the equipment provided by Tables of Basic Allowances.

Lubricating oils. Oil should be placed in the engine crankcase through the crankcase filler pipe. *Extreme care should be taken to prevent dirt and other foreign materials from entering the crankcase. Oil measures and funnels should be scrupulously clean.* Oil is applied to other required surfaces by using an oil or squirt can.

Gear lubricants. Gear lubricants should be introduced into gear cases through their filler pipes. If a gear lubricant bucket with pump is available it should be used to expedite the work. Care should be taken to prevent overfilling, and the level should be checked after the mechanism has been warmed in operation.

Chassis lubricants. Chassis lubricants should be applied by using a high-pressure hand gun or a power-operated grease gun. Lubrication fittings should be cleaned before the grease is applied. Grease should be forced through the bearing until clean grease is visible on both ends of the bearing.

Cup grease. Cup grease is applied by removing, filling, replacing, and screwing down the grease cups.

Water-pump grease. Water-pump grease, when required, should be applied by using a pressure hand gun or by using the grease cup, depending on the lubrication fitting. When the hand gun is used, care must be taken that the pump housing and the gland packings are not damaged.

Fiber greases. Fiber greases should be applied to universal joints and clutch release bearings by using a low-pressure hand grease gun or by using the grease cups provided. Care should be taken that grease seals are not damaged.

Miscellaneous lubricants and fluids. *Spring lubricant.* If the spring is provided with a spring cover, the lubricant should be applied with a grease gun. If no cover is provided, the spring should, when necessary, be removed, disassembled, cleaned, and thoroughly lubricated. Partial lubrication may be achieved by jacking up the vehicle, separating the spring leaves, and applying lubricant between the leaves with a putty knife.

Penetrating oil. If supplied in small quantities, the penetrating oil will usually be furnished in a can, similar to a squirt can, ready for use. If furnished in quart or larger containers, the oil should be removed from its container, as required, and applied with a squirt can.

Petrolatum or vaseline. Petrolatum or vaseline should be applied with a brush or by using small quantities applied by hand.

Cleaning solvent. Cleaning solvent should be used with a stiff bristle brush or applied by an air-operated cleaning gun. Metal brushes should never be used when cleaning an engine.

INSPECTIONS

General. A thorough and comprehensive system of inspections is a primary requisite for the satisfactory operation of motor vehicles. Inspection has as its purpose the detection of deficiencies of mechanical condition, quality of maintenance operation, appearance, servicing, and operation of motor vehicles, and the recommendation of corrective measures to prevent recurrence of such deficiencies. While the appearance of the vehicle as a whole is of some concern, the important inspection is that which covers the normal adjustments and mechanical condition of operating units, and that which investigates the lubrication requirements of a vehicle with a view to maintaining the standards of reliability and performance originally built into the vehicle. Such inspections are classified as command, maintenance, and technical inspections. See Chapter XIII for the Preventive Maintenance inspections performed by the driver.

Command Inspections. It is the duty of all commanders to make regular and frequent inspections of their motor vehicles and of the operating and maintenance activities of their commands.

Maintenance Inspections. Maintenance inspections are a part of scheduled maintenance operations and normally should be performed by personnel of the operating organization during and upon completion of these operations.

Daily inspections. Daily maintenance inspections normally are made by the chief of section under the supervision of company, battery, or similar unit officers. They

consist in checking and supervising the work of the vehicle operator in his performance of daily maintenance operations.

Weekly inspections. Weekly maintenance inspections normally are made by the chief of section under supervision of company, battery, or similar unit officers. They consist of checking and supervising the work of the vehicle operator in his performance of weekly maintenance operations. In addition, the chief of section should examine the less accessible places, looking for rust spots, leaks, breaks, and excessive or deficient lubrication. The serviceability and completeness of tools and other equipment should be thoroughly checked. A guide for his weekly inspection should be drawn up and issued to him to fit the particular vehicle or vehicles he is assigned. A suggested guide is as follows:

Accident report	Lights
Appearance	Lubrication
Battery	Mats
Body bolts and screws	Rear-view mirror
Bows	Running boards
Brakes	Running gear
Broken metal	Seat brackets
Bumper and tow hooks	Servicing
Canvas	Special mountings
Chains	Springs
Condition of motor	Steering
Curtain fasteners	Straps
Doors	Tail gate
Driver's permit	Tires:
Extinguisher	Cuts
Fender bolts	Inflation
Fenders	Unusual wear
Floor boards	Tool brackets
Glass	Tools
Handle and latches	Traction devices
Hood fasteners	Upholstering
Horn	Wheel lugs
Insulating material	Windshield wiper
Keys	Defects to be corrected:
Leaks on ground .....	.....

Lubrication inspections. All lubrication operations performed by the driver normally are inspected by the chief of section. The motor sergeant inspects all lubrication, including that performed by the driver, if any, and that performed by unit maintenance personnel.

Monthly (1000-mile) inspections. The monthly (1000-mile) maintenance inspection is a check on company, battery, or similar unit maintenance. It normally is made by the motor officer of that unit but may be made by the regimental, battalion, or similar unit motor officer. Before reporting a vehicle to the motor officer for maintenance inspection, the motor sergeant assures himself that the work of his mechanics has been properly performed and that no items have been overlooked. The motor officer spot checks such items as he believes necessary, including those that are inaccessible or frequently neglected. He should make a short road test of the vehicle.

Six-months (6000-mile) inspections. The six-months (6000-mile) maintenance inspection is a check on the maintenance work performed by the regiment, battalion, or similar unit. It will be made by the unit motor officer, assisted by qualified enlisted personnel, upon completion of the six months (6000-mile) maintenance operation in a manner similar to that described for the monthly (1000-mile) maintenance inspection.

Technical Inspections. Technical inspections are made by fully qualified technical personnel of the supply services to determine the vehicle condition. These inspections are covered in AR 850-15 and in Circular 1-10, OQMG. W. D., Q. M. C. Form No. 260 is used.

RECORDS AND REPORTS

General. In maintaining a fleet of motor vehicles, certain reports and records are indispensable. They must be simple and complete, and must be prepared by qualified personnel. The regimental motor officer should periodically assemble all personnel of the regiment who prepare these records and reports, and explain and demonstrate the proper yet simplest manner of keeping them. Posting of all reports daily or at proper intervals should be enforced by supervisory personnel, and a careful check should be maintained by the commanding officers of all units operating and maintaining motor transportation. Records often clearly indicate items that require attention. Usually low gasoline or oil mileage might indicate poor motor-vehicle performance or unauthorized disposition of gas or oil by the driver. Excessive repairs might indicate careless driving. The records as a whole keep the organization commander informed of the general condition of the vehicles and assist him in making timely request for overhaul and replacement.

Reports and Records Required by Regulations. *Driver's Report—Accident, Motor Transportation (Standard Form No. 26).* Plate 28. This form will be carried on every military motor vehicle.

Investigating Officer's Report—Accident, Motor Transportation (Standard Form No. 27). Plate 29. The officer designated to investigate an accident will submit his report on this form (AR 850-15).

(1) Action to be taken in case of traffic accident. (a) *By the driver.* In case of injury to person or property the driver of a motor vehicle will stop the vehicle and render such assistance as may be needed, complying with state and local regulations relative to reporting accidents. He will fill out immediately at the scene of the accident Standard Form No. 26 (Driver's Report—Accident, Motor Transportation) and deliver it to his commanding officer immediately on returning to his station. This must be done in every case regardless of how trivial the accident may appear to be or whether Government property or personnel only is injured.

(2) *By the commanding officer.* Upon receipt of Standard Form No. 26, the immediate commanding officer will at once notify his commanding officer. The latter will make an investigation of the accident or detail an officer to do so when the reports show personal injury, damage to private property, or damage to Government property in excess of \$10 for material and commercial labor. A complete and detailed report will be made to the investigating officer on Standard Form No. 27 (Investigating Officer's Report—Accident, Motor Transportation). Par. 17, AR 850-15.

Permit for Motor Vehicle Operators (W. D., Q. M. C. Form No. 228). This permit must be in the possession of the vehicle operator at all times when he is operating the motor vehicle.

Motor vehicle operator's permits are issued only to individuals who have satisfactorily passed an examination conducted by a qualified commissioned officer covering the following subjects:

Mechanical. Nomenclature and functions of major units of the motor vehicle.

Operation.

Actual driving of the vehicle, involving use of controls, reversing, and parking under usual conditions of traffic and terrain.

Traffic regulations, road procedure, safety precautions, speed limits, and vehicle abuse.

Maintenance. First echelon (vehicle operator's maintenance).

Possession of a motor vehicle operator's permit should be a guarantee that the individual is a qualified driver. Accordingly, the permit will be suspended or revoked when an accident or other cause so warrants.

Motor Vehicle Technical Inspection Report (W. D., Q. M. C. Form No. 260). (Plate 30.) This form will be used in recording the technical inspections required by AR 850-15.

Driver's Trip Ticket and Performance Record (W. D., Q. M. C. Form No. 237). No vehicle will be dispatched unless a trip ticket accompanies the vehicle. Drivers should be required to complete the form in full detail. These forms provide information required in the vehicle service record books. It is sometimes more convenient to make up a form for local use.

Motor Vehicle Service Record Book (W. D., Q. M. C. Form No. 248). This record will be kept for every quartermaster motor vehicle in operation. It constitutes the

17. Was an investigation made by a policeman (civil or military)? Yes 91 80, state
 Name Sgt. Wm. Price No. 16
 Precinct or station Phoenix City

18. Names and addresses of persons other than driver in Government car: _____
Sgt. Harry Goss

19. Names and addresses of other witnesses: _____
None

Port Harry Jones
 (Signature of driver)

I certify that the above report was delivered to me on the _____ day of _____, 19____
 at _____ o'clock _____

(Signature of officer in charge)

(Official title)

(Government department or establishment)

NOTE.—This report should be attached to report of Investigating Officer.

10-1810

U. S. GOVERNMENT PRINTING OFFICE: 1927.

Standard Form No. 26
 Approved by the President
 June 10, 1927

DRIVER'S REPORT—ACCIDENT MOTOR TRANSPORTATION

INSTRUCTIONS TO DRIVERS

In case of injury to person or damage to property:

- Stop car and render such assistance as may be needed.
- Fill out this form, ON THE SPOT, so far as possible.
- Deliver this report promptly to your immediate superior.

Failure to observe these instructions will result in disciplinary action.

- Name of Government driver: Pvt. Harry Jones
- Stationed at Fort Benning, Ga.
- Make and type of Government vehicle Chevrolet
1 1/2 Ton Truck
- Service number W-31104
- Name and address of owner of other vehicle (or owner of property damaged) Mr. James Brown
419 10th Ave., Columbus, Ga.
- Name and address of driver of other vehicle
Same as listed under par. 5
- License of other vehicle: State Ala. License No. 311-610
- Place of accident: City Phoenix City.
 Street 14th St.

10-1811

9. Date of accident May 10, 1928 Hour 4 P.M.

10. Names and addresses of persons injured; nature of injuries:
Mr. James Brown
419 10th Ave.,
Columbus, Ga. - Broken Arm

11. Describe damage to Government vehicle Rear Left
Fender Crushed - Tail Light +
Bracket Broken Off.

12. Describe damage to privately owned vehicle, or other property: Bumper, R. Fender, R. Head -
light torn off. R. Wheel +
Tire Damaged. (1937 Chev. Sedan)

13. What signal was given by each driver prior to accident?

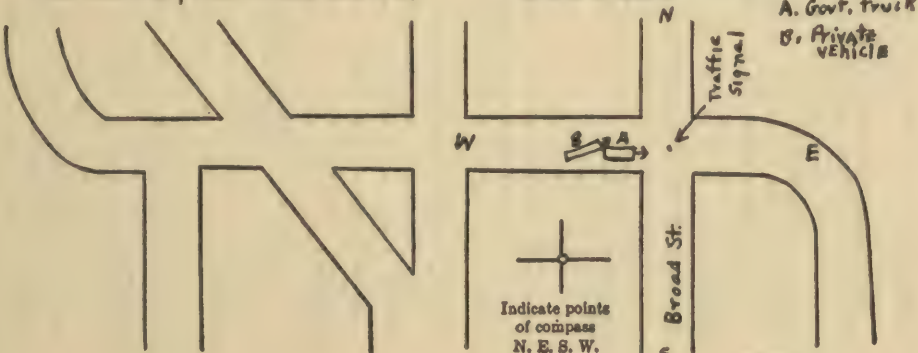
Driver Army Vehicle put
Left Hand out, indicating Stop

14. State condition of light, weather, and roadway:

Light - Good, Weather - Clear,
Roadway - cement.

15. Explain how accident happened: Gov. Truck in
Canvey stopped at Traffic Light
Civ. Car hit rear of Gov.
Truck.

16. Label streets and indicate measurements; show the position of each vehicle at the time of the accident and show by dotted lines the course of each vehicle just before and just after the collision.



10-1810

FRONT

Standard Form No. 97 Approved by the War Department June 10, 1917

INVESTIGATING OFFICER'S REPORT—ACCIDENT MOTOR TRANSPORTATION

This report, together with the driver's report (Form No. 26), must be submitted promptly in accordance with Departmental regulations.

DATE	_____	19	Hour	_____	M.
Place: City or town	_____		State	_____	
Street	_____				
Weather	_____				
Condition of roadway	_____				
Make and type of vehicle	_____				
Name of driver	_____				
Service No.	_____				
Hit title and section	_____				
Make and type of vehicle	_____				
License No.	_____				
Owner: Name	_____				
Address	_____				
Driver: Name	_____				
Address	_____				
License No.	_____				
Name and address and extent of injuries	_____				
PERSONS INJURED	_____				
If medical aid was rendered, state by whom	_____				
DAMAGE TO OWNED VEHICLE	_____				
DAMAGE TO OTHER VEHICLE	_____				
DAMAGE TO OTHER VEHICLE PROPERTY	_____				
WITNESSES (Important)	_____				
ALWAYS SECURE NAMES AND ADDRESSES OF WITNESSES	_____				
Name	_____				
Address	_____				
Did city or State police report the accident?	_____				
If report was made, attach copy.	_____				
Government car was proceeding from _____ to _____	_____				
Was driver performing official duty?	_____				
Indicate the duty: _____	_____				
<div style="text-align: right;">(over)</div>					

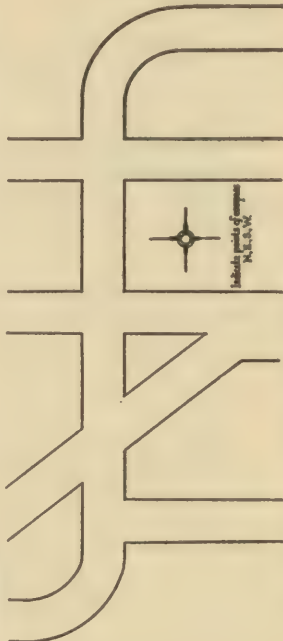
BACK

INVESTIGATING OFFICER'S SKETCH

Show in black the relative positions of the colliding vehicles, or of the vehicle and pedestrian, just before the collision, and at the time of the collision.

Show in red their relative positions just after the collision.

Label the streets and every object depicted, and indicate measurements; show by dotted lines the course followed by each vehicle, and add any explanatory statement that would aid in an understanding of the occurrence.



If the above diagram is not applicable, attach substitute diagram.

I hereby certify that the foregoing is a true and correct report of the accident, according to the best of my knowledge and belief, based upon investigation made by me personally. Attached hereto as a part thereof are the following papers: _____

Investigating Officer.

INSTRUCTIONS TO INVESTIGATING OFFICER

1. Attach driver's accident report, with supplemental signed statement from driver. Among other things, the driver's statement should describe the course of the Government car, and the course of the vehicle or person collided with, just before and at the time of the collision; the rates of speed and how estimated; the signals of warning; condition of brakes, of lights, of streets as to being slippery; errors made by driver to avoid collision; facts showing whether or not other driver, or person was in fault, etc.

2. Attach signed statement from each witness.

3. Attach copy of traffic regulation violated, if any.

4. Attach photographs of scene of accident and of damaged cars, if any taken.

5. Attach Findings and Recommendations of Investigating Officer.

service record of the vehicle and will be transferred with it. Instructions relative to the posting of this record are contained in the book itself. This is a most important record, and must be accurately and promptly posted.

Ordnance Motor Book (W. D., O. O. Form No. 5956). This record will be kept for every ordnance vehicle in operation. It constitutes the service record of the vehicle and will be transferred with it. Instructions relative to the posting of this record are contained in the book itself. This is a most important record, and must be accurately and promptly posted.

Other Forms. Other prescribed forms are:

Data for U. S. Registration Number (W. D., Q. M. C. Form No. 220).

Motor Vehicle Transfer Form (W. D., Q. M. C. Form No. 221).

Report of Motor Vehicles on Hand (W. D., Q. M. C. Form No. 252).

Report of Changes of Motor Vehicles (W. D., Q. M. C. Form No. 253).

Gasoline and Lubricant Issue Slip (W. D., Q. M. C. Form No. 231).

Motor Vehicle Operation and Maintenance Cost Record (W. D., Q. M. C. Form No. 222).

Dispatching Record (Motor Pools) (W. D., Q. M. C. Form No. 254).

Special Forms. Special forms necessary or beneficial in keeping the above records or making the above reports should be obtained from the supply services charged with third and fourth echelon maintenance functions when available. Otherwise such forms or charts must be prepared by the second echelon, normally under the direction of the regimental motor officers. Included are such forms as:

Automotive operations sheet. A major part of the data for the motor vehicle record book is abstracted from the driver's trip tickets. Where the entries on this record book are made monthly, a bulky stack of trip tickets accumulates before the entries can be made in the record book. To obviate this condition and to require all operating, inspection, and maintenance data to be consolidated up to date, the operations sheet may be utilized. One of these is required for each vehicle, and is an invaluable aid to the maintenance personnel.

Preventive maintenance operations guides.

Lubrication guides. A lubrication guide should be prepared for each class and type of vehicle.

Unserviceable vehicle tags. This tag, conspicuously attached to a vehicle, indicates a disabled vehicle and provides a ready means of locating the trouble.

THE MOTOR DRIVER

Training. The manner in which the individual drivers perform their duties determines the mobility and dependability of the motor vehicle fleet as well as that of the single vehicle.

Assignment of Drivers. A driver and, if authorized, an assistant driver should be assigned to each motor vehicle. Except for instruction, inspection, or other like purposes, the vehicle should not be operated by other drivers if it can be avoided.

Motor Vehicle Abuse. Territorial commanders and commanding officers of organizations, posts, camps, and stations are responsible for the careful operation of motor vehicles under their jurisdiction. This responsibility is primarily one of preventing improper use and vehicle abuse. Mechanical failures occurring during the ordinary life of a unit assembly of a motor vehicle which are found not to be due to defective material or workmanship, or to service requirements, are to be considered *prima facie* indication of the existence of vehicle abuse. The most important forms of abuse are:

Excessive speeds, particularly over rough roads, and across country.

Improper use of controls, particularly gear shift, clutch, brakes, and choke.

Racing engine, particularly when cold.

Overloading and improper loading.

Lack of lubrication or use of improper lubricants.

Lack of inspection, particularly systematic inspection.

Deferred maintenance, including lack of proper servicing and adjustments.

Accidents.

Motor vehicle abuse when found due to carelessness or indifference of responsible personnel will be considered cause for disciplinary action.

Safety Precautions. Rules for road procedure will be published in appropriate manuals. Failure to observe any one of the following rules will be considered cause for disciplinary action:

Military or civil police on duty will be strictly obeyed and state and local highway regulations will be carefully observed.

A vehicle will never double (pass traffic moving in the same direction)—

When going around a corner or blind curve.

In ascending or descending hills unless safe passage is assured.

At street intersections or crossroads.

Unless the road is wide enough to allow at least two feet between vehicles.

Vehicles will be halted at railroad crossings not guarded by military personnel or civilian watchman.

Vehicles will be slowed down to a safe stopping speed at all road intersections not covered by traffic control personnel or traffic control devices.

Drivers will not permit their vehicles to coast down hills with clutch disengaged or gear shift lever in neutral.

Fire Precautions and Fire Fighting. Motor vehicles, shops, and parks are constantly exposed to fires. Drivers must, therefore, be instructed in and required to comply with pertinent fire-prevention regulations. In addition they must be instructed and drilled in the use of fire-fighting equipment and in removing vehicles and other property from the danger area.

Gasoline tanks will not be filled nor will work be performed on the carburetor or fuel system of a motor vehicle in the presence of a flame. If illumination is required to perform the work, an electric light will be used.

Every motor-propelled vehicle will be equipped with an approved type of fire extinguisher.

Water will not be used on a gasoline or oil fire as it will spread the fire. Fire extinguishers of the types prescribed in the existing Table of Allowances will be used. A box or bucket of sand with suitable scoop for spreading is also effective in extinguishing gasoline fires.

A waste can will be kept in the shop or garage, and all greasy and oily rags will be placed therein. Before closing time this can together with pans containing oil, gasoline, or other inflammable materials will be removed from the shop or garage and placed in some open space where there is no fire hazard. All trash will be disposed of daily.

The two and one-half gallon foam extinguisher will be protected from freezing.

All rags partially stained with grease or linseed oil, but of further use, will be put in a place where they are not likely to cause a fire.

Trucks loaded with inflammable rubbish, such as excelsior, paper, or packing material, will be unloaded before parking for the night.

Gasoline will not be used for cleaning purposes in shops or garages.

Asphyxiation by exhaust gases of motor vehicle engines. Garages, shops, and vehicles carrying personnel will in all cases be well ventilated. No motor vehicle engine will be run in a garage or shop longer than necessary to move the vehicle in or out, unless it is standing near wide-open doors, or the exhaust is conducted through an aperture.

Antifreeze Precautions. Officers responsible for the operation and maintenance of motor vehicles will see that all necessary precautions are taken to prevent damage incident to the freezing of water in cooling systems of motor vehicles.

Accident Prevention. The formulation and observance of definite rules will eliminate the majority of accidents incident to the operation and maintenance of motor vehicles. These rules should include the following:

Place the transmission gear-shift lever in neutral and set the hand brake before hand cranking an engine or starting it with the starting motor.

Make sure the way is clear before a vehicle is moved. If the driver cannot see the road, he should be directed by a dismounted individual. This is particularly important when a vehicle is backed or is moved through bivouac areas and across country at night without lights.

Stop the engine before anyone gets under a vehicle. If it is necessary for a mechanic to work under the vehicle the engine is running, precaution must be taken that the vehicle cannot move accidentally.

Block up a vehicle safely before the wheels are removed. Do not place reliance on jacks.

Remove the battery when a vehicle is taken into the shop for major repairs.

Provide ample ventilation for garages, shops, vehicle cabs, and vehicles carrying personnel.

Do not operate motor vehicle engines in a garage or shop longer than necessary to move the vehicle in or out, unless the vehicle is standing near wide open doors or the exhaust gases are removed through a safe outlet fixture.

In case of carbon monoxide poisoning, remove the patient to open air, keep him quiet, apply artificial respiration and warmth, and obtain medical assistance as soon as possible.

Speed Limits. The caution plate mounted on a motor vehicle indicates the maximum safe speed for which the vehicle is designed. This speed presumes good operating condition of vehicles, good road, load, normal traffic conditions, and skilled driving. It will not be exceeded.

Fast driving over rough, slippery, or congested roads is prohibited and the fact that the vehicle was being operated within the authorized speed limit will not be accepted as an excuse for such driving.

Speeds will not exceed the limits set by law or regulations of the States or towns in which the vehicle is being operated.

Regulated governors, when installed, will be set and sealed at the maximum speed considered safe and not to exceed that indicated on the name and caution plate. Tampering with sealed governors will be considered cause for disciplinary action.

Subject to the above limitations, corps area and exempted station commanders may establish such further limits, as, in their opinion, conditions in their respective commands may warrant.

Nomenclature and General Purpose of Major Units of the Motor Vehicle. Preliminary instruction should cover the nomenclature and purpose of major assemblies only, in order that the driver may become familiar with his vehicle without being confused by details. Detailed instruction in nomenclature, function, operation, use, lubrication, maintenance, and limitations of motor vehicles, and the nomenclature, care, and use of vehicular tools and equipment should be given in subsequent periods.

Motor Vehicle Controls. The day-to-day condition and the ultimate service of a motor vehicle, as well as safety to life and property, depend upon the condition and proper use of the controls. Consequently, careful instruction and supervision are necessary to insure the correct use of these important devices. The following controls should be explained and demonstrated:

Carburetor choke control (if not automatic).

Carburetor throttle control, to include accelerator.

Ignition switch.

Spark control (if not automatic).

Transmission gearshift lever.

Transfer case gearshift lever.

Clutch pedal.

Steering wheel.

Brakes, hand and foot.

Winch controls.

Dump controls.

Aids to Motor Vehicle Control. Although the devices given below cannot be classed as controls, they aid in motor vehicle control and should be explained and demonstrated.

Light switches, including blackout.

Horn button.

Rear-view mirror.

Windshield wiper.

Speedometer.

Instrument-Board Gages. Gages are placed on the instrument panel in plain view of the driver to give information concerning certain assemblies and systems of the motor vehicle. The instructor should explain the purpose of each gage, give its normal reading, and tell the driver what to do when an abnormal reading is observed.

Clutch, Transmission, and Brakes. Drivers should familiarize themselves with the location and manipulation of the clutch pedal, the transmission gear shift lever, and the brake lever and brake pedal before actual driving instruction starts. For this purpose the motor vehicles should be blocked up securely with all wheels off the ground.

When the candidate first gets into the driver's seat, he should be required to assume the correct position; that is, sit erect, without stiffness, squarely behind the steering wheel; head erect, eyes looking to the front; hand on opposite sides of the steering wheel, on a horizontal line generally through the center of the wheel, grasping the steering wheel rim firmly but without tenseness; both feet flat on the floor boards except when actually manipulating the accelerator, the clutch and brake pedals, or the starter switch.

After the candidate has familiarized himself with the location and manipulation of the controls, the instructor should start and warm up the engine. He should then demonstrate the operation of the accelerator; coordinated movements of the accelerator, clutch pedal, and transmission gear shift lever; gear shifting, to include reverse; operation of the brake controls; manipulation of the steering wheel; and the use of the engine as a brake. Upon completion of the demonstration, the candidate should take the driver's seat and practice manipulating the controls until he becomes reasonably proficient. Careful supervision should be exercised to insure correct performance.

Careful supervision should be exercised over the following:

Engine speeds. The engine must not be raced. During the preliminary instruction period, the accelerator may be blocked to limit the engine speed. The accelerator should be released when shifting gears (except when double clutching), and depressed gradually when the load is applied to the engine.

Clutch pedal. To disengage the clutch, the clutch pedal should be depressed to the limit of its travel. To engage the clutch, the clutch pedal should be released gradually. The results to be anticipated if the clutch pedal is released too rapidly, and the injurious effects of allowing the foot to rest on the clutch pedal should be explained.

Transmission gear shift lever. The lever should be moved smoothly but firmly from one position to another and must never be forced.

Position of the feet. While actually driving, the right foot should rest on the accelerator and the left foot on the floor boards. *The feet should be placed on the control pedals only when the pedals are to be operated.*

Brakes. Brakes should be applied gradually with just enough pressure to accomplish the desired results. The braking effort of the engine should be used when retarding the vehicle speed, the clutch being disengaged in time to prevent stalling the engine.

Inspection Before Operation. A motor vehicle is not ready for service until certain items have been checked and certain Preventive Maintenance inspections have been made.

Before moving his vehicle from its overnight parking position, the driver, under proper supervision, makes this "Before Operation" Preventive Maintenance inspection and reports the results to his chief of section or other designated individual. The driver is held strictly responsible that all requirements are met. Items are checked as follows:

Before starting engine—

The surface (ground or floor) under the vehicle for evidence of leaks.

The radiator for proper amount of water and to see that air passages are open.

The gasoline tank for proper amount of gasoline.

The crankcase for lubricating oil. Spare oil if required.

The engine for loose parts or electrical connections.

Pneumatic tires, including spares, for proper inflation.

The horn and all lights for proper functioning.

Front axle and steering linkage.

Tools and necessary equipment.

Carried load for condition and distribution.

Towed load for condition, attachment to prime mover, and brake connections.

All transmissions and power take-offs in neutral.

Drain valve in air brake storage tanks closed.

After starting engine—

Fan operation.

Engine for loose parts and unusual noises.

Proper functioning of all dashboard instruments as engine comes to operating temperature.

Action of windshield wiper.

The vehicle is moved, and the clutch, transmission, steering, and brakes are tested.

Starting and Warming Up the Engine. Special attention should be devoted to the proper starting and warm-up period in order that unnecessary engine wear may be prevented. The procedure outlined below is satisfactory under average operating conditions:

Set the hand brake.

Place the transmission gear shift lever in the neutral position.

Set the choke control and the hand throttle control. Consider the peculiarities of the engine, engine temperature, fuel, and manufacturer's instructions. Care should be taken to avoid excessive use of the choke.

Disengage the clutch.

Turn on the ignition.

Engage the starter switch contacts. Release the starter switch contacts as soon as the engine starts.

If the starter device fails to engage the engine flywheel, release the starter switch contacts and allow the starter armature to come to rest. Try again. If the device still fails to engage, report to the chief of section or other designated person.

If the starter device engages the engine flywheel and locks, release the starter switch contacts, turn off the ignition, place the transmission in high gear, release the brake, and rock the vehicle backward. If the starter device fails to disengage, place the transmission in neutral and report as above.

If the starter device engages the engine flywheel and the engine fails to start after several attempts, report as above. The starter switch contacts should not be engaged for periods longer than 10 to 15 seconds.

If the engine is magneto equipped and hand cranking is necessary, follow the manufacturer's instructions.

Adjust the setting of the dash throttle control to give the desired engine speed. Release the clutch pedal.

Allow the engine to warm up to the proper operating temperature, opening the choke as rapidly as the engine temperature permits. *The choke should be closed, or partially closed, only as long as necessary and should never be used excessively.* The engine has reached a safe operating temperature when upon acceleration with the choke wide open there is no backfiring, and when the oil pressure needle remains below the maximum reading on the oil pressure gage scale with the engine running at its normal operating speed.

Inspection During Operation. During operation the driver should be alert to detect malfunctioning of the engine. He should be trained to detect unusual engine sounds or noises and to follow the proper procedure when they occur. He should frequently glance at the instrument panel gages and know what to do when abnormal readings are observed. Before vehicles start on a march or are dispatched on individual missions, care-

ful instructions should be given to drivers concerning the action to be taken when operating troubles occur. Only under exceptional circumstances should a motor vehicle be operated after trouble has developed which will prove serious if operation is continued. When in doubt, the engine should be stopped and assistance obtained. Inspection during operation applies to the entire vehicle and should be emphasized throughout the driving instruction period.

Inspection at the Halt. At each scheduled halt during the march or at intervals during a day's work on dispatch, the driver should make a careful inspection of his vehicle to determine its general mechanical condition. Detection and correction of defects should give reasonable assurance that the vehicle is ready for continued operation. If the defects cannot be corrected during the halt, proper disposition of the vehicle should be made so that unnecessary delay may be avoided and a major failure prevented. Drivers and maintenance personnel should make full use of halt periods to place all vehicles in condition for continued uninterrupted service. A suitable general routine, the sequence of which may be altered to suit a particular type of vehicle, is as follows:

Allow the engine to run a short time. Listen for unusual noises.

Walk around the vehicle, looking carefully for fuel, oil, and water leaks.

Inspect all tires for inflation, cuts, nails, stones, and indications of misalignment. On track-laying vehicles, examine tracks for adjustment and for worn, loose, broken, or missing parts. Note condition of traction devices, if used.

Feel brake bands, wheel hubs, and gear cases for evidence of overheating.

Inspect the lights, if traveling at night with lights.

Check the amount of fuel in the tank.

Check the quantity of water in the radiator.

Check the quantity and condition of the oil in the crankcase or oil reservoir. Add oil if necessary.

Inspect the condition of the cargo and towed load, if any.

Report promptly the result of the inspection to the chief of section or other designated individual.

Inspection After Operation. At the conclusion of the day's work, the driver should make an inspection similar to that made at halts but more thorough and detailed. Repair operations performed by the driver are determined by his ability and the equipment available for his use. If defects cannot be corrected, they should be reported promptly to the chief of section or other designated individual. The inspection should be followed by preventive maintenance. A suitable routine is as follows:

Check all items included in the inspection at the halt, testing lights in all cases.

Raise the hood and look for loose, missing or broken parts, and indications of improper operation.

Examine grease seals for evidence of failure or over-lubrication.

Check front axle, steering gear, and linkage, and front springs for condition, alignment, and attachment.

Check rear axle and rear springs for condition, alignment, and attachment.

Examine propeller shaft for condition, tightness of connections, and foreign materials wrapped around the shaft.

Examine brake linkage for loose, worn, lost, or broken parts.

Check body bolts; tighten or replace as required.

Check tools and equipment.

Report results.

DRIVING INSTRUCTION

General Rule. Careful instruction and painstaking supervision must be the rule during the driving instruction period to insure that the driver learns the correct performance of his duties and forms the proper habits. This chapter on driving instruction of necessity contains valuable information on the conduct of motor marches.

Gear Shifting and Use of Clutch. Preliminary driving should be conducted on a large open field where steering is of secondary importance. A qualified instructor should accompany each candidate to explain procedure, demonstrate application, and insure cor-

rect driver performance. Candidates should be permitted to drive at will with the transmission in the lower gear ratios until they are reasonably familiar with the operation and control of their vehicles, after which the driving should become progressively more difficult.

After the driver has become reasonably proficient in shifting from lower to higher gears, he should receive instruction in double clutching, the procedure for which is as follows:

Disengage the clutch and shift to neutral; at the same time decelerate the engine.

Engage the clutch and accelerate to an engine speed slightly in excess of that required in the lower gear to maintain the vehicle speed.

Disengage the clutch and shift to the next lower gear; at the same time slightly decelerate the engine.

Engage the clutch; at the same time accelerate the engine to effect clutch engagement without shock to the power transmission system.

Practice double clutching until proficient in shifting from a higher to a lower gear.

On medium and heavy vehicles it is sometimes difficult to shift from a low gear to a higher gear without clashing the gear teeth. The clashing may be avoided by using the double-clutching procedure *without accelerating the engine during the shift*.

Use of Transmission and Auxiliary Transmission. A transmission is provided so that the engine may be permitted to run at a speed at which sufficient horsepower is developed, and at the same time permit the vehicle to travel at a speed commensurate with the road and load conditions. The addition of an auxiliary transmission, sometimes included as a part of the power transmission system, increases the number of gear ratios available and permits greater flexibility in the transmission of power.

Drivers should understand what happens when the gear shift lever is moved and must be practiced in the manipulation of the controls and the proper use of the transmission and auxiliary transmission. An engine should never be permitted to labor unduly when a change in transmission-gear ratios would lighten the load.

The auxiliary transmission normally provided on military motor vehicles has two gear ratios: high, which does not change the gear ratios provided by the main transmission; and low, which gives a greater gear reduction (higher reduction ratio) than that provided by the main transmission. The auxiliary transmission is controlled by a gearshift lever in the driver's compartment. The high range is used for normal operation and the low range for heavy duty. *The ratios in the auxiliary transmission of most types of vehicles should not be changed when the vehicle is in motion.*

Use of Brakes. The brakes should be in such condition that a hard application will cause all wheels to be locked, but the driver must realize that the maximum retarding effect occurs just before the wheels lock. Intermittent applications will reduce the wear of brake linings and drums. Application of the brakes should be gradual and with just enough force to accomplish the desired result.

Judicious use of the braking effect of the engine will increase the serviceable life of the brake linings and drums. When the driver anticipates a stop, he should make full use of the engine braking effect, disengaging the clutch in time to avoid stalling the engine. When descending hills, a driver should use the engine as a brake by selecting and engaging the proper gear ratio, and use the intermittent application of the brakes to prevent overspeeding the engine. The ignition should not be turned off. The engine speed when descending a hill should be no greater than the speed necessary to ascend the hill when using the same transmission gear ratio. On steep hills the gear train necessary to give the desired results should be engaged before the vehicle is committed to the hill. Attempting to shift gears after the vehicle has started down a steep slope may result in a runaway vehicle.

At all times a driver should know the performance and the general condition of his vehicle brakes. When operating conditions require vehicles to move through water, the brakes become very inefficient because of moisture on the brake linings and in the brake drums. If the distance to be traversed is short, considerable water may be kept out of the brake assemblies by a slight application of the brakes while the vehicle is in the

water. After passing through water, the brakes should be set slightly and the vehicle operated until sufficient heat has been generated to dry the brakes.

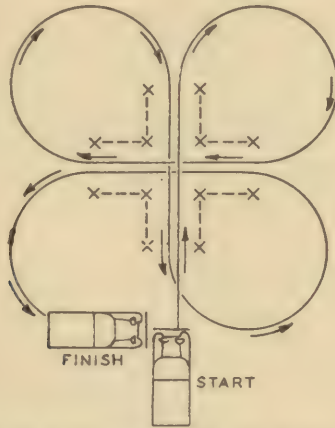
Vehicle stopping distances are dependent upon the nature and condition of the road surface, the condition of the brakes, the weight of the load, and the kind and condition of tire treads. When operating at a speed of 20 miles per hour on a dry, smooth, level road free from loose material, every motor vehicle or combination of motor vehicles should be capable, at all times and under all conditions of loading, of stopping within the following distances when the foot brake is applied:

Vehicles or combination of vehicles having brakes on all wheels . . . 30 feet

Vehicles or combination of vehicles not having brakes on all wheels . . . 45 feet

Drivers should be cautioned against the use of brakes when a vehicle is skidding and when it is being operated on ice-covered roads.

Turning, Backing, and Parking. After the driver has acquired facility in starting, simple driving, and stopping his vehicle, he should be practiced in maneuvering in difficult places. The ability to turn his vehicle in a confined space, to back it accurately, and to park it properly under various conditions are essential requirements for the motor vehicle driver.



(The figure should be symmetrical, with the stakes placed to allow an over-all side clearance of approximately 18 inches.)

Plate 31. Reverse Turning Course.

Turns should be made at speeds commensurate with the road load, and traffic conditions. A vehicle driver should always give the appropriate arm, electrical, or mechanical signal in sufficient time to afford ample warning that a change in direction is to be made. Turns should start and end in appropriate traffic lanes and should be made with as little confusion to other traffic as possible. At least one hand should be kept on the steering wheel when the vehicle is in motion.

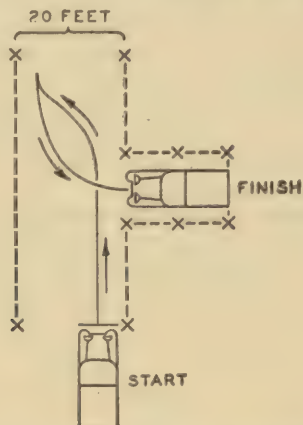
A driver should never back a vehicle until he is certain that the way is clear. When the driver's view is obstructed, he should act as directed by an assistant on the ground. When backing unassisted, the driver should always give warning of the movement by sounding his horn. Considerable practice is necessary to back a vehicle safely and accurately. This is particularly true when the driver is required to back a towed load.

Parking includes turning and forward or backward movement of the vehicle in more or less restricted spaces. Factors which should be given consideration when parking are space for maneuver of vehicle, solid standing, interference with other traffic, and cover if applicable.

The use of stake driving courses will permit instruction and practice without other traffic interference and will make closer supervision possible. The instruction courses shown in Plates 31, 32, and 33 are recommended.

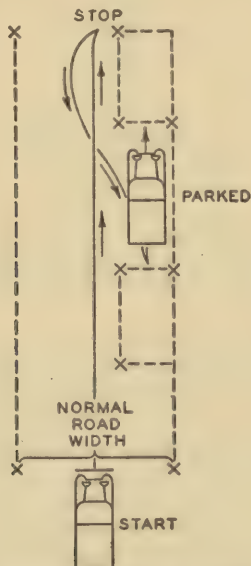
Starting Engine Under Unusual Operating Conditions. *Gasoline boiling in carburetor.* Some engines when stopped after having reached an operating temperature radiate

enough heat to boil the gasoline in the carburetor float chamber. This condition, which is not uncommon during hot weather operation, causes a rich mixture in the intake manifold. To start the engine, the hand throttle is fully opened, the carburetor choke is left in the normal operating position, and the engine started. The throttle



(The figure should be symmetrical, with the stakes placed to allow an over-all side clearance of approximately 18 inches.)

Plate 32. Backing Course.



(Stakes should be placed so that when parked the vehicle will have an over-all longitudinal clearance of approximately 10 feet and a lateral clearance of approximately 3 feet.)

Plate 33. Parking Course.

should be adjusted to the desired engine speed only after the engine begins to run smoothly. Intermittent depression of the accelerator when the engine is not running will also produce a rich mixture in the intake manifold; the procedure outlined above should be followed in starting the engine.

Vapor lock. Vapor lock is caused by vaporization of the fuel before it leaves the carburetor jets. This condition results in a mixture that is too lean to sustain engine operation. The best solution is to wait until the fuel cools and returns to liquid form.

After liquification takes place, the engine may be started in the normal manner.

Signals. Drivers' arm signals. Before a driver changes the direction or slows the speed of his vehicle, he should give the appropriate arm signal to warn other drivers of the contemplated change. Arm signals should be clearly made and should be given in time to afford ample warning. There is as yet no standard set of drivers' arm signals. Drivers of military vehicles operated in civilian traffic should use the arm signals prescribed for the locality in which the vehicle is being operated. Drivers' arm signals which are satisfactory for military use are:

Turn right. Extend the left arm outward at an angle of 45° above the horizontal.

Turn left. Extend the left arm outward horizontally.

Slow or stop. Extend the left arm outward to an angle of 45° below the horizontal.

Pass and keep going. Extend the left arm horizontally and describe small circles toward the front with the hand.

Command and signals commonly used in a motorized unit are:

Start engine. Simulate cranking.

Report when ready to move (given by unit commander). Extend the arm vertically, fingers extended and joined.

Ready to start. Senior in truck stands on running board, faces leader, and extends the arm vertically, fingers extended and joined, palm toward the leader.

Stop engines. Cross arms in front of body at the waist and then move them sharply to the side. Repeat several times.

Increase speed. Carry closed fist to the shoulder and rapidly thrust it vertically upward several times to the full extent of the arm.

Decrease speed. Extend arm horizontally from shoulder, palm to front and move up and down vertically about 24° . Continue motion as long as decrease of speed is desired.

Prepare to mount. Extend the arm horizontally to the side, palm up, and wave the arm upward several times. *Mount.* Same signal with both arms.

Prepare to dismount. Extend the arm diagonally upward to the side, palm down, and wave the arm downward several times. *Dismount.* Same signal with both arms.

Close up. Extend the arm horizontally to the side, palm to front, then describe a 2-foot vertical circle. Each driver repeats.

Open up. Extend the arm horizontally to the side, palm to front, then move the arm down to a vertical position and up to the horizontal, describing a 90° arc. Each driver repeats.

Immediate danger. Use three long blasts of whistle or automobile horn repeated several times, or three equally spaced shots with rifle or pistol. The person giving the signal points in the direction of impending danger. This signal is reversed for warning of air, mechanized attack, or other immediate and grave danger.

Drivers to turn around simultaneously. Extend both arms horizontally toward the drivers and describe small vertical circles, then signal forward in the desired new direction. When the distance between vehicles permits and the convoy is long, this signal may be given by a motorcycle messenger passing back along the column.

Other authorized signals may be found in the manuals for the arms and services.

Electrical and mechanical signals should be used, but not depended upon, when vehicles are so equipped.

Road Rules and Traffic Regulations. Observance of prescribed road rules and traffic regulations permits the movement of traffic with a maximum of safety and a minimum of confusion and traffic direction. The following general rules should be observed by all drivers:

Vehicles will keep to the right of the road.

The appropriate warning signal will be given before changing direction, slowing down, or stopping.

The driver will be alert and pay attention to road signs, convoy signals, and traffic directions.

The right-of-way will be given promptly to faster moving vehicles.

Speed will be reduced on dry, dusty roads.

Speeds for night driving, without lights, will be determined by road conditions, degree of visibility, and skill of the drivers.

Lights will be dimmed when meeting another vehicle, if driving with lights.

Unnecessary use of horns is prohibited.

A disabled vehicle will not delay unnecessarily the march of a column.

A vehicle will never pass traffic moving in the same direction—

When going around a corner or blind curve.

When ascending or descending hills unless safe passage is assured.

At street intersections or crossroads.

When the road is not wide enough to allow at least 2 feet between vehicles.

A driver who has been assigned a place in a column will not pass another vehicle in the same column unless that vehicle is disabled or he receives a signal to pass.

A driver when meeting and passing an oncoming vehicle will—

Pass on the right giving at least half the road.

Slow down if operating conditions are hazardous.

Permit the vehicle having a clear road ahead to have the right-of-way.

Vehicles will be halted at railroad crossings not guarded by military personnel or civilian watchmen.

Vehicles will be slowed down to a safe stopping speed at all road intersections not covered by traffic control personnel or traffic devices.

Vehicles will not be permitted to coast down hills with the clutch disengaged or the transmission in neutral.

Vehicles will clear the roadway before being halted.

Vehicles will not be halted on bridges, in defiles, at points where the vision of other drivers is restricted, or in such manner as to block cross traffic or entering side traffic.

During the halt—

The engine will be stopped if the vehicle is to stand longer than a few minutes.

All personnel will keep to the right of the vehicles.

The prescribed inspection and maintenance functions will be performed.

Passengers will not mount or dismount from moving vehicles.

State and local traffic regulations will be observed unless otherwise ordered.

Under blackout conditions, conform strictly to all restrictions on use of ordinary and blackout lights.

Marching. Successful marching requires well-trained drivers and teamwork on the part of all elements of the command. Drivers must therefore be trained in march organization, march formations, march regulations, camouflage and concealment of vehicles, and procedure in case of air or mechanized attack. Through instruction and the enforcement of regulations, a degree of march discipline is attained which enables an organization to pass over roads with a maximum of speed and safety and a minimum of interference with other traffic, and to arrive at its destination in the best possible condition.

During training in close column marching, special attention should be paid to safe driving distances between vehicles. These distances, which vary with vehicle speeds, should be prescribed initially to aid the driver in visualizing his proper place. The following rule, properly modified to meet special conditions, gives the minimum distances for safe marching: *The distance in yards between vehicles should be twice the speedometer reading.*

When marching over rolling terrain, a higher rate of march and smoother marching may be attained if drivers are permitted, within maximum prescribed speed, to increase the speed of their vehicles before commencing to climb. Vehicles should be slowed down while going down grades to compensate for the distance gained when running a hill. This practice will prevent excessive jamming and will allow drivers to take advantage of power and momentum to negotiate hills without excessive shifting of gears. Running hills is particularly advantageous when march columns are made up of mixed vehicles.

Chains and Traction Devices. Chains and traction devices should always accompany the vehicle to which they pertain. They should be kept in serviceable condition and in proper adjustment to permit installation with a minimum of delay. Chains and traction devices should be removed when the necessity for their use no longer exists in order to prevent unnecessary damage to roads.



Plate 34. Giant Lugs.

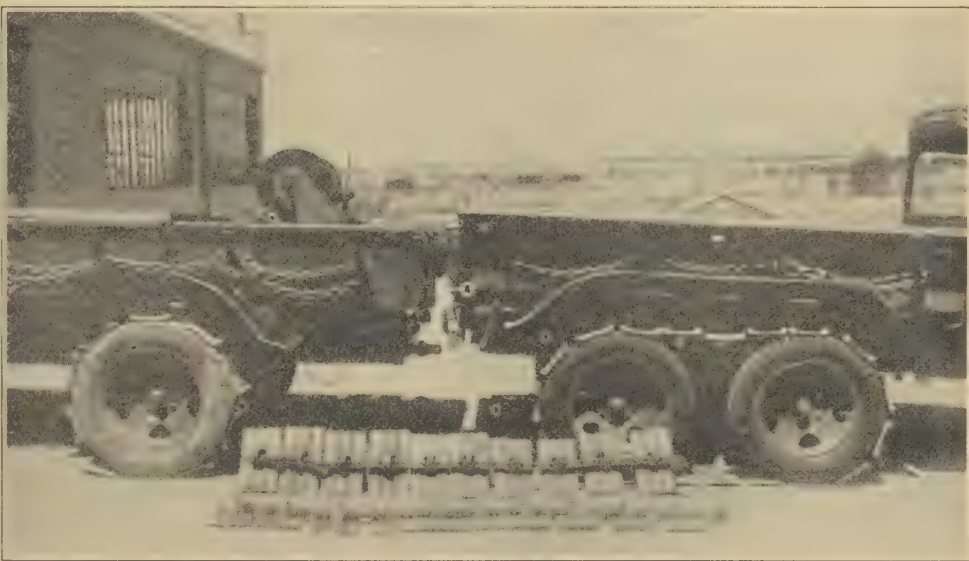


Plate 35. Traction Devices.

Chains. Chains are generally necessary in mud, sand, snow, or slush ice. Chains should not be used on ice-covered roads when they cannot bite into the ice. The following general rules apply to the application and use of chains:

The chains are applied before the vehicle becomes mired.

The chains are so applied that rotation of the wheel tends to close the chain fastenings.

If improperly installed, rotation of the wheel opens the fastening and the chain will be lost.

Fairly loose adjustment gives better traction and less tire wear than tight adjustment.

On all wheel-drive vehicles without center differential or other compensating device, chains must be installed on all wheels to prevent unnecessary strain.

When only single chains are provided for dual-tired wheels, they should be installed on the outside tires.

Traction devices. Giant tire lugs. Plate 34. Giant tire lugs provided for some military motor vehicles give better traction without increasing flotation. They are made for use on dual-tired wheels. The general rules for the application and use of chains apply, with few exceptions, to the application and use of giant tire lugs.

Traction bands. Plate 35. Traction devices such as circular and oval bands are provided for some military motor vehicles to give increased traction and flotation. Circular bands should be chained to the wheel to prevent slippage of the tires inside the band. Oval bands are used on bogie axles and should be applied and adjusted in accordance with manufacturers' instructions.

Tractor grousers. Grousers increase traction but do not improve the flotation qualities of the vehicle. Two general types of grousers, removable and integral, are used on tractors provided for the military service. The removable type should be applied when necessity for their use arises. The integral type grouser is a part of the track shoe and cannot be removed, but the grouser action may be eliminated by the use of street plates bolted to the track shoes.

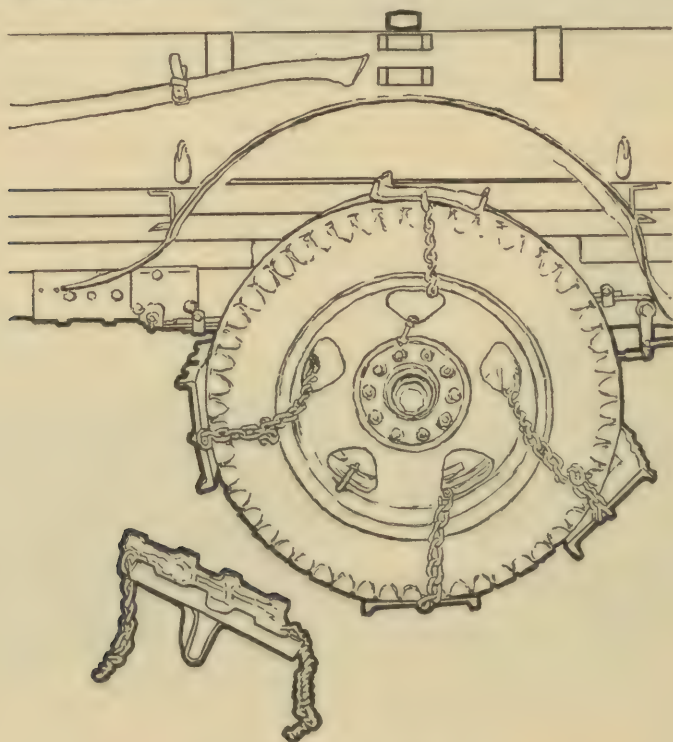


Plate 36. Lug Plate.

Grouser Ropes or Chains, and Lug Plates. (Plate 36.) Improvised single grouser ropes or heavy single chains may be carried when a driver is operating a passenger vehicle alone. If the vehicle stalls on a muddy road, the traction of one or more wheels may be increased by the use of these devices. Makeshifts such as a short piece of rope or web

belts may be used for the same purpose in case of an emergency. These should be applied only after chains have failed to give sufficient traction.

Grouser Bars. (Plate 37.) For track-laying vehicles, grouser bars may be improvised. A grouser bar is installed across both tracks by means of the grousers after the vehicle is stalled in a mired position. The vehicle is rolled over it and the bar removed before it strikes the back of the vehicle. A pole or piece of timber may be secured across the tracks to serve the same purpose.

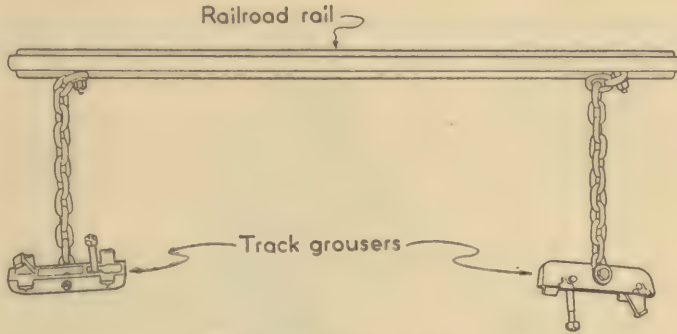


Plate 37. Grouser Bar.

Wheel Mats. Flat mats improvised by boarding together strands of rope, or pieces of heavy canvas, with ropes attached to the four corners are useful to place under the wheels where the going is soft. When a vehicle is stalled with wheels slipping, wheel mats may be used by attaching them to the wheels at one end, or they may be laid down in front of the wheels with the end away staked down. To increase traction over a soft or slippery spot, one or several of these mats may be tied end to end. They may then be staked down or maneuvered ahead of the wheels. Sacks or, in an emergency, blankets and like articles may be used to serve the same purpose.

Cross Country Driving. After the driver has acquired facility in driving and maneuvering, he should be taken through a series of increasingly difficult cross country operations, such as ditches, ruts, chuckholes, woods, slippery roads, mud, difficult curves, and up and down steep slopes until he becomes reasonably proficient in handling his vehicle under all conditions. This training should include field expedients and the application and use of chains and tractor devices.

The training should start with individual performances and empty vehicles and should progress to group performances with loaded vehicles and with towed loads if used in the organization.

Trouble Truck. Although equipment in different types of motorized units will vary, each organization will generally have one trouble truck, usually equipped with a winch. All drivers should be taught winch operation, and be governed by the following principles:

The winch truck should be taken across the obstacle first.

When necessary, the winch truck is backed across an obstacle under the assisting power of the winch with cable attached to a deadman or tree. The power of the drive wheels should assist the winch, but the gears must be so chosen that the wheels will cover ground faster than the winch cable is pulled in.

The same principle should be applied when pulling in a vehicle with the winch; that is, the towed vehicle should assist with its maximum traction. The best power combination generally results if the winch is operated in the highest gear that will give sufficient power and the towed truck is pulling in lowest gear.

After the winch truck has crossed an obstacle, the cable may be run out, the winch locked, and the truck used as a towing vehicle, or the truck may be halted and the winch utilized.

When the winch is used on a difficult pull, the winch truck may be held in place by use of the brakes, wheel blocks, or by anchoring to a tree or deadman. Traction devices will assist in holding the vehicle in place.

Certain precautions are necessary in the proper use of the winch cable. Whenever the towing cable is slipped over the ground it should be protected by placing pieces of wood under it. Power must be applied to the cable gradually. As a precaution against the lashing ends of a broken cable, all men should stand clear before the winch cable is tightened.

Hoist Attachment and Wrecking Crane. A hoist attachment may be issued to units. This equipment is intended primarily for use with the maintenance section. It may be mounted in either the trouble truck or the tender carrying the equipment of the maintenance section.

A wrecking crane may be improvised to serve the same purpose as the hoist attachment. The crane is installed so that it extends over the tail gate approximately 4 inches. The winch cable is placed over the crane only when necessary to get an upward towing lift.

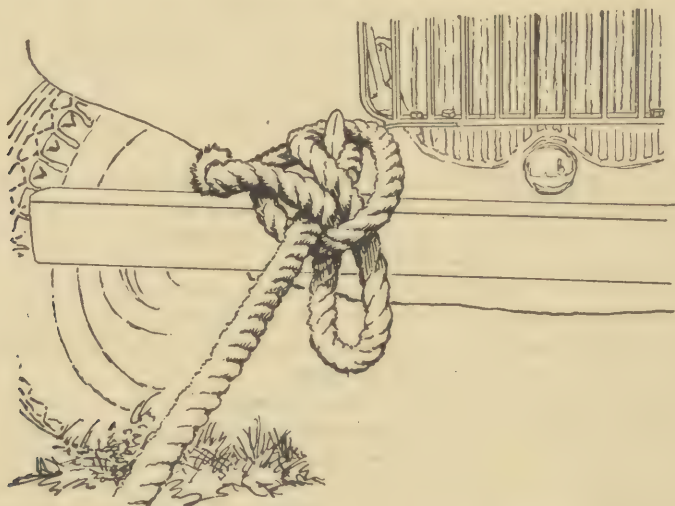


Figure 1. Clove Hitch (End Not Pulled Through).

Plate 38. Knots.

Either the hoist attachment or the wrecking crane will assist in towing a disabled vehicle in an elevated position when the steering mechanism or the axle is damaged. They may often be of use to give a towing lift on a mired vehicle. Care must be taken not to attempt to lift too heavy loads, which will nose-up the hoisting vehicle.

Track-Laying Tractors. Where available, tractors will serve as powerful towing expedients. They have good flotation and powerful traction. Once the tracks begin to slip, the clutch should be quickly disengaged and the tractor moved out in the opposite direction. A new trial is then made on new footing, inserting a tow chain or cable between the tractor and towed load if necessary. The tractor has little if any more hill-climbing ability than a truck. When needed as a tow in such cases it should be moved to a position where it can pull without climbing a steep slope.

Tow Chains or Cables. Tow chains or cables should be about 25 feet long and should have a hook on one end and a ring or loop on the other. Cables and chains $\frac{3}{8}$ to $\frac{1}{2}$ inch give sufficient strength.

Spreader Bars. To prevent the frame from being bent inward in front, improvised spreader bars should always be used to attach a cable or tow chain to both tow hooks.

Prolonges. A prolonge is made from a piece of rope about 30 feet long by making a loop at one end. With this, man power or a tow from another vehicle may be most

efficiently and quickly applied. A detail of men may drop a prolonge over a tow hook before a vehicle is completely stalled and help it past a difficult point. Tow ropes can most safely be attached to tow hooks, pintles, or around the spring shackle. Knots easily untied, such as the clove hitch with end left through to form a bow, should be used. The double Blackwall knot for attachment to tow hooks and the single Blackwall knot for attachment to the pintle are the easiest to untie, but may occasionally slip. (Plate 38.) A 1-inch rope will safely stand a tension of about one ton. Larger or smaller ropes in-

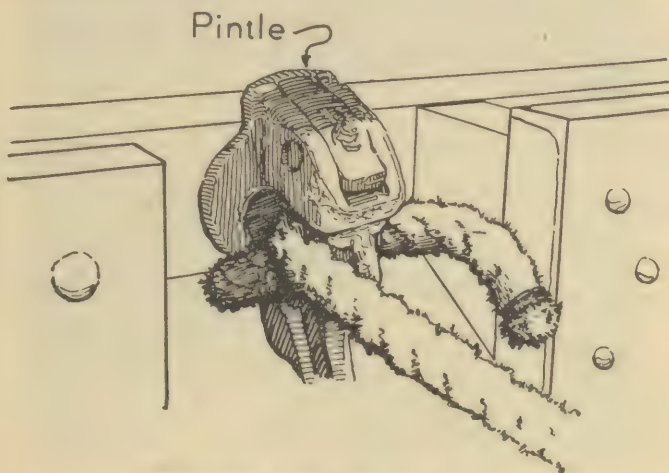


Figure 2. Single Blackwall Knot.



Figure 3. Double Blackwall Knot.

Plate 38. Knots—Continued.

crease or decrease in safe tension limits by 500 pounds for each $\frac{1}{8}$ -inch difference in size from a 1-inch rope. The vehicle being towed should always assist with its own power.

Block and Tackle. Where a winch truck is not available, a block and tackle is carried in the trouble truck. Attached to a tree, anchored stake, or deadman it is useful to multiply the towing power of either manpower or a towing vehicle.

Towing Bars. Towing bars are used when a vehicle is to be towed.

A-Frame. (Plate 39.) An A-frame is an expedient which combines both a lift and a tow. It is easily constructed with two poles approximately 12 feet long and two tow

chains or cables. Holes are dug as supports for the foot of the frame, or a cross chain or plank is used to prevent the poles from spreading. Care must be taken to place the A-frame far enough away from the towed vehicle so that, when it is lifted over, the foot of the legs will not damage the front of the vehicle. This simple device is a useful expedient when a wrecking crane or hoist attachment is not available to lift a vehicle out of and over a ditch or hole. It is also of use when a heavy vehicle is completely mired.



Plate 39. A-Frame.

Deadman Installations. (Plates 40 and 41.) A deadman gives a firm anchor for various towing operations. To get the best results the following points are essential:

Position. A position for the deadman is best if chosen at least a yard behind a natural crest or mound. It should be far enough back so that it will not interfere with the vehicles clearing the obstacles and the attached cable or chain will not exert an upward pull.

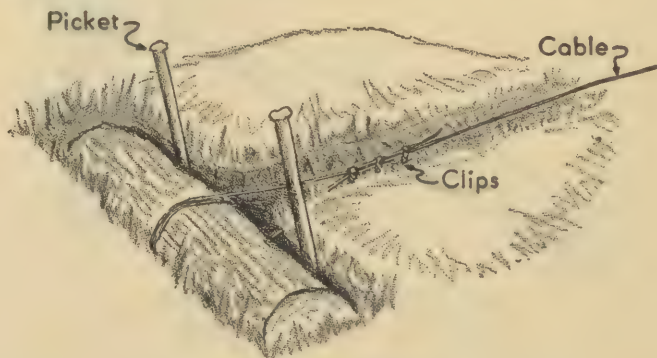


Plate 40. Deadman.

Digging. A hole is dug about 1 foot deep and long and wide enough for the deadman. The bank in the direction of pull is cut straight and is slanted away about 15° to the vertical. The bottom of the hole is cleared at a right angle to this bank. To assist in strengthening the top edge of the hole on the side in the direction of pull, two stakes are usually driven on either side of the cable at a slightly greater angle to the vertical than the bank. They are driven flush with the slanted bank near the top. A

trench for the cable is cut from the hole through the crest of the hill or mound. This should be slightly deeper than the bottom of the hole at the beginning and should continue out in a descending slope.

Cable attachment. A rectangular tie or larger timber of the type used for a wheel block is most suitable for the deadman, since it presents the maximum surface to oppose the direction of pull. The cable or chain is attached to the deadman so that the largest dimension is vertical and the pull on the cable is exerted along the bottom surface.



Plate 41. "Deadman" Type of Anchorage.

Anchored Stake. (Plate 42.) Two stakes and a rope lashing may be used to quickly install an anchored stake which will withstand considerable tension. The first stake is driven into the ground at a little greater than a right angle from the direction of pull. The second stake is driven at an angle slightly closer to the ground at 3 to 6 feet away



Plate 42. Anchored Stake.

from the direction of pull. A rope is used to anchor the top of the first stake to the bottom of the second. In order that this rope will not slip down on the first stake, it is first tied to the bottom of the second, then wrapped over itself with a one-half clove hitch at the top of the first stake. The rope then is passed around the second and another half clove hitch is completed over the first, wrapping the rope around below the first hitch. This lashing is completed a number of times before the rope is secured

to the second stake. A third stake may then be used to twist the lashing tight, after which it is driven into the ground.

Luminous paints which emit a faint glow in darkness may be used to replace night-lighting devices and may also be used on panels temporarily placed on the ground to guide a unit at night.

Mechanical Expedients. The usual limitations for repair of the vehicle by the driver are stated early in this chapter. However, the following repairs can be made in the field in case of an emergency:

Broken spring leaves are splinted by means of strong pieces of wood or metal held in place with wire. One or several tent pins may be used. If necessary, a block of wood is secured between the frame and axle to prevent spring action. When necessary, displacement of the axle is prevented by running a wire around the front spring hanger and the axle.

When the light fuze is burned out, it may be temporarily replaced with tinfoil. This should be done only after the short in the system has been corrected.

A fan belt may be replaced with rope or the old one fastened together with wire. Friction tape may be wrapped around the belt to hold it in place.

When water has shorted the ignition system, it should be wiped away from the spark plugs. The wires should then be removed from the distributor head and wiped dry.

Points to be Observed. In training drivers for difficult operations the following points should be observed by officers and noncommissioned officers:

The column leader should have a good driver and a vehicle in good mechanical condition.

On the approaching doubtful crossings or steep hills, a quick reconnaissance to determine the best route is made on foot ahead of the first vehicle.

Guards are dropped where drivers in rear should be cautioned.

While moving, a driver is given freedom in the operation of his vehicle within the limits prescribed by the commander to insure safe and efficient operation of the column.

When a vehicle is stalled, the driver must be given advice and help. A decision is required at once as to whether or not it can be moved by the next vehicle or by men at hand. If it cannot be moved without holding up the column, it is left for the crew with the trouble truck.

The column must be kept moving. When the road is blocked, a new route around is immediately found for other vehicles.

When the column comes to a halt, officers and section leaders should move forward to assist in carrying out the above principles.

Power, Momentum, Traction, and Flotation. The ability of a motor vehicle to negotiate difficult terrain depends upon its power, momentum, traction, and flotation. A proper appreciation of these related factors will assist military personnel in the choice of a practical expedient to meet most road difficulties.

Power in any gasoline-propelled vehicle depends primarily upon maintaining sufficient engine speed. A shift to a lower gear allows the application of more power, but with loss of forward momentum.

Momentum is the energy stored up by the weight in motion of the vehicle. It increases with the speed of the vehicle.

Traction is the maximum wheel or track thrust that may be applied to the ground surface without slipping.

Flotation is the ability of a wheel or track to ride the ground surface.

Ascending Steep Slopes. *Approaching normal hill.* On approaching the usual hill, the leading driver should select a sufficiently low gear and proceed to the top without attempting to race his engine to keep up the normal rate of march. The driver of each succeeding vehicle closes up as the ascent begins and loses distance as the vehicle ahead picks up speed at the crest.

Approaching difficult hill. Where the grade is slippery or the slope particularly

steep, the leading driver on approaching the hill should select a sufficiently low gear and continue on to gain the maximum momentum which his load and the condition of the road permit. The driver of the next vehicle should slow up and halt before he arrives at the approach. He should wait long enough to see that the vehicle ahead has cleared the crest. The driver of each succeeding vehicle should close up, halt, and follow only after being certain that the vehicle ahead will negotiate the hill.

Overcoming failure. On a steep ascent, stalling usually occurs because of either power or traction failure. Four solutions are presented: another run in a lower gear may be made, the load may be decreased or increased, traction devices may be added, or towing power may be applied.

Taking another run. If a driver has failed to give his vehicle the maximum momentum practical on the approach or if a shift has been made at the last moment in an effort to increase the power, the driver is usually at fault. Another trial, with the maximum momentum practicable or with a lower gear ratio, may succeed.

Increasing or decreasing load. If power fails with maximum momentum and the lowest gear ratio, the load may be decreased. However, if failure is due to loss of traction and flotation is good, sufficient traction may be gained by increasing the load. This is usually done by loading men over the driving axle or axles. This solution will often be successful on vehicles with two-wheel drives, and on other vehicles not loaded but with heavy towed loads. On nontowing vehicles having front-wheel drives, the addition of more than the normal load is seldom advisable, because these vehicles will have sufficient traction to pull to the limit of their power.

Applying traction devices. If the road is soft or slippery, chains or other traction devices should be installed.

Applying towing power. Usually the most expeditious method of getting over a difficult ascent is to apply towing power utilizing manpower, the winch or another vehicle.

If the hill or critical ascent is short, the use of manpower applied through prolonges is usually the quickest and most practical method.

If the hill is long and a winch truck is available, it should go up first and then pull the other vehicles over.

If one truck can be pulled over, a long cable or chain may be used to connect each vehicle in turn so that each helps the next over the ascent.

Towed loads may be disconnected and pulled up separately. If necessary, several vehicles may be connected in tandem to pull up a towed load.

Failure precaution. As a precaution, when a vehicle stalls on a hill, the driver should not shift gears until he has tested the brakes by disengaging the clutch gradually. After the brakes have been tested and found to hold, the driver should shift to reverse and back the vehicle down the hill or to the side of the road in gear.

Descending Steep Slopes. Descents should be approached similarly to ascents. The following principles should be observed:

Choosing descent. Very steep slopes should be descended straight down, so that in case sliding occurs the vehicle will not get out of control. All personnel except the driver should be dismounted.

Braking. Hills should always be descended in gear. The correct gear for the descent of a steep slope should be chosen during the approach and should not be changed until the bottom of the hill is reached. As a rule, the same gear is required in going down a hill as would be used in coming up the same hill. A sufficiently low gear should be selected so that the brakes need not be used. However, when necessary, brakes should be applied intermittently, being careful not to lock the wheels. In the descent of a hill, no attempt should be made to maintain the normal rate of march by racing the engine. *The ignition should not be turned off.*

Assistance. Outside assistance should be given to vehicles descending steep slopes. It may be applied as follows:

By manpower through the use of prolonges or block and tackle. A rope may often be snubbed around a tree or post.

By use of another vehicle on top of the hill, moving forward in lowest gear, connected by chain, cable, or rope to the vehicle descending.

By use of the winch, the cable being run out in gear, the descending truck operating in the lowest gear.

By setting brakes on towed loads and attaching a safety rope or tackle. When necessary, towed loads should be disconnected and let down separately.

Muddy Roads. The usual muddy road that will be encountered is soft and slippery on the surface, while underneath it is generally hard or will pack sufficiently to support a vehicle. Soft spots will allow spinning wheels to quickly dig in. The following principles are applicable to negotiating this type of muddy going:

Traction aids. Chains usually give the best aid to traction and prevent skidding.

Gear. In general, the highest gear that will give sufficient power is selected. As the loss of momentum and the sudden application of increased power at a critical point start the wheels to spin, the need for a gear reduction must be anticipated.

Momentum. Momentum should be maintained across slippery places and up grades. Usually when slipping occurs, the speed of engine should immediately be decreased so that the wheels can take hold.

Choice of track. Old ruts are the hardest packed and should generally be chosen. This principle usually holds for all vehicles following. The exception to this rule is covered in the paragraph below. Where road centers are high, ruts should be straddled or a new track should be made.

Procedure on stalling. Once a vehicle has come to a complete stall in mud, the clutch is disengaged at once. No new trial is attempted until an outside check-up is made. Proper procedure for quickly extricating a stalled vehicle is dependent upon judgment and experience. The following possibilities are suggested:

Dismounting personnel. If personnel are carried, they should dismount and try to push the vehicle out. Often the lightened load and this applied power will be sufficient. In making a try with outside aid, the driver should apply power to the wheels gradually by easing in the clutch. This trial should not be continued to such an extent that the wheels dig in.

Selecting best way out. Usually a vehicle can be moved backward for a new trial easier than it can be moved forward.

Use of manpower. If prolongs and sufficient men are available, an immediate attempt should be made to move the vehicle by manpower.

Applying nearest suitable tow. If a light tow will probably succeed, the next suitable vehicle ahead or behind may be used. Often the next vehicle can be detoured and used for a tow. Where the vehicle has slid off a highly crowned road, men with prolongs attached to the sides may assist in helping the vehicle back onto the road.

Stalled vehicle. Where the vehicle is found to be hopelessly stalled, a winch, tractor, vehicles in tandem, or a block and tackle must be used.

Where a vehicle operating alone becomes stalled in mud, the driver and any personnel that may be with him are dependent on one of the following methods of extricating it:

Improving traction. Any additional traction devices such as wheel mats, lug plates, or grouser ropes may be applied. Often one or more drive wheels must be jacked up and traction and flotation increased by placing brush, boards, rocks, or similar material under the wheels. When possible, a pole used as a lever inserted under the hub or in place of the wheel cap is the easiest method of raising the wheels.

Digging out. Ditches dug in the direction that the wheels are expected to move assist in moving the vehicle out. When wheels are in deep ruts, usually cross ditches dug at an angle to the ruts with dirt thrown into the ruts are necessary to carry the wheels back on to a straddle position over the rut.

Windlass method. The windlass method of having a dual-wheel truck pull itself out of a bad mud hole is simple and rather certain of success. A single long cable with loops on each end, or two tow cables, and four stakes are required. The vehicle may be pulled out either backward or forward. Two anchored stakes are installed on the

bank at the same distance apart as the wheels and directly in front of or behind the vehicle. The loop ends of the cables are taken in between the tires of each dual wheel and secured by passing the loop between the spokes and over the hub. The cables are then attached to the anchor stakes. The vehicle is then pulled out on its own power by allowing the cable to wind up between the dual wheels whenever slipping occurs.

Pole method. A similar principle may sometimes be applied by inserting a pole as a track between the dual wheels that are slipping. This method may be made more efficient with track-laying vehicles by attaching the pole to the track. The vehicle is rolled over it and the attachment is removed before strain is placed on the track.

CAUTION: Because of the danger of slipping under the vehicle, personnel should be cautioned against pushing on the side of a moving vehicle that has slipped into the ditch from a high crown road or on a vehicle that has slipped into old wheel ruts.

Swampy or Boggy Ground. Where water has been standing for a considerable time and swamp grass has grown, a surface crust has formed on top of a bottomless soil. Certain variations in principles and procedure apply in this exceptional type of muddy going.

Avoiding swamps. Boggy or swampy soil may usually be avoided. Every effort should be made to move over the highest ground available.

Traction devices. The addition of dual wheels in front, traction bands, and any other aids which increase the wheel surface in contact with the ground are a distinct advantage.

Personnel dismount. Personnel should dismount and assist with prolongs at critical points.

Maintaining momentum. The main requirement in moving over a boggy piece of ground is to move over it rapidly without stopping. Wheel spinning should be kept at a minimum.

New tracks selected. The grassy crust may carry one vehicle but may not support another in the same track. Therefore each vehicle should follow a separate track. A guide should precede each vehicle on foot, locating the hard ground and guiding the driver carefully over the best route.

Stalling. When a vehicle comes to a traction stall, the clutch should be disengaged at once. No attempt should ever be made to move it without outside power.

Towed loads. To pull towed loads, several trucks may sometimes be hooked in tandem; or they may be pulled abreast, with the towed load attached by a pulley sliding on a cable between the two trucks.

Gumbo and Other Sticky Soils. Gumbo and other sticky soils present a problem similar to that of boggy ground. In addition these soils give little traction and stick to the tires and wheels in great masses. Boards, shovels, knives, and the like may be fastened to cut the mud from the wheels. Whenever possible, old, hard-packed roads should be selected through these areas.

Passing Through Sand. Flotation in sand increases more or less below the surface. Usually sand will support a vehicle moving rapidly. However, traction is very limited because wheels are continually slipping. As soon as a drive wheel begins to spin it digs in fast. Although the difficulties in passing through sand vary, several additional principles are possible in overcoming traction failures in sand:

Increasing tire surface. In exceptional circumstances air pressure may be decreased in the tires to give sufficient flotation.

Digging vehicle out. When the sand is somewhat encrusted below the surface, the vehicle will continue to creep while the wheels spin. As long as the vehicle continues to move, the wheels may be kept slowly spinning, allowing the vehicle to dig itself out.

Using same track. In order to reduce road friction, vehicles should follow exactly the tracks of the vehicle ahead.

Making roads. Hog or chicken wire fencing staked on the surface of sand will usually make a satisfactory surface for movement of motor vehicles.

Driving on Snow and Ice. On soft snow flotation is at a minimum, while on ice traction is at a minimum. In addition to many of the principles already listed, the following are applicable to winter driving:

Traction aids. Chains on all wheels are usually the best safeguard in normal winter driving. However, on ice they add little or no traction and are apt to give a false feeling of security, because they increase skidding.

Moving over fresh snow. When breaking freshly fallen snow, manpower should be readily available to push the first vehicle or to tow it with prolonges where the snow is deep. Other vehicles, following exactly in track, usually move under their own power if they are able to gain momentum in approaching difficult slopes and crossings.

Braking. The engine should be used as a brake. The driver shifts to a lower gear when more braking power is needed. When used, brakes should be applied lightly and released quickly if skidding begins.

Accelerating. Rapid acceleration should not be attempted, as it may cause one drive wheel to spin, thus losing traction or causing skidding.

Overcoming skidding. If skidding occurs, the brake or clutch should not be touched. The accelerator should gradually be released. The front wheels are turned in the same direction the hind wheels are skidding, so that the vehicle will be carried forward with the momentum in a straight line parallel to its original path.

Holding vehicles on road. Where necessary, men with prolonges may hold vehicles on dangerous icy roads.

Crossing Ditches and Deep Ravines. Narrow or shallow ditches. Ditches in width up to nearly the diameter of the tire and wider shallow ditches should always be traversed at an angle, so that the drive wheel on one side will take hold of the far edge of the ditch at the same time that the opposite wheel is going into it. As this angle of crossing is a severe strain on the frame, springs, and driving mechanism, personnel should be dismounted to assist by pushing at the critical point. Ditches must be crossed slowly.

Wide ditches or ravines. When a ditch is wider than the diameter of the tire and deeper than the running board or undercarriage clearance, no attempt should be made to pass it until the banks are thrown in and the bottom filled up. Such ditches should be crossed at right angles. If they are wet, they should be approached slowly and the vehicle speeded up without wheel slipping just as the front wheels cross the lowest point.

Fording Shallow Streams. Fordings should be attempted only after careful reconnaissance. The following points are to be observed:

Cross slowly. As a rule nothing is to be gained by attempting to use momentum in crossing streams. They should be crossed slowly in a low gear.

Disconnect fan. If there is any danger of the water surging or splashing to the fan, it should be disconnected for the crossing, usually by loosening a bolt and raising the generator.

Dry brakes. After crossing a stream brakes should be applied intermittently until dry enough to hold.

Check lubrication. At the first opportunity wheels, crankcase, universal joint, differential, transmission, and subtransmission should be checked for proper lubrication.

Deep-Stream Crossings. When the situation demands that streams too deep for fording be crossed, the first consideration should be to obtain ponton bridges, bridging materials, ferries, or rafts. However, even if none of these are available, motor vehicles can be taken across streams of almost any depth without serious damage if suitable precautions are taken. The tackle and tow indicated in Plate 43 are used. The vehicle must be properly prepared for submersion by closing all openings and removing such parts as will be seriously harmed or rendered inoperative by moisture. After crossing, the vehicle should be thoroughly serviced and water removed from units.

Bridges. Speed caution signs should be carefully observed, as well as the signs showing maximum capacity. When the capacity of a bridge is not sufficient, the towed load should be pulled across separately. Track-laying vehicles should be started across a bridge so that they will not have to be turned, because steering them places a severe strain on the bridge.

Driving on Curves. Skidding on slippery curves is avoided by a reduction of speed before the vehicle goes into the turn. The importance of this consideration depends upon two factors:

Centrifugal force, which tends to throw a vehicle to the outside of a curve, varies as the square of the speed.

When the brakes are applied the weight of the load is shifted from the rear wheels to the front wheels, reducing the traction on the rear wheels and increasing the tendency to skid. When the brakes on a towed load are not applied, the tendency to skid is increased.

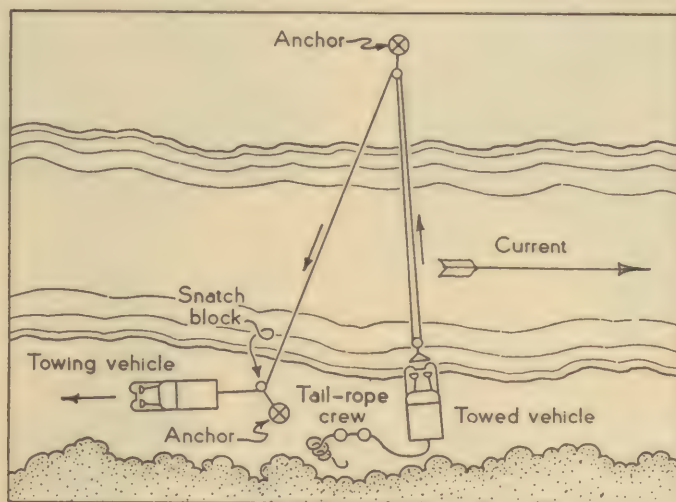


Plate 43. Tackle for Deep Stream Crossing.

Negotiating Turns With a Towed Load. If a curve is too sharp for truck and towed load, it is usually possible to uncouple the truck and drive it around the turn, and then by use of a tow cable or block and tackle to pull the towed load around the turn.

Righting an Overturned Vehicle. (Plate 44.) In order to get a maximum leverage on an overturned vehicle, a cradle of two ropes should be passed over the body of the vehicle, one in front of the windshield and the other in rear of the center of the vehicle. Both should preferably be tied to the body frame or spring shackle. Brakes should be applied before the vehicle is righted. Any of the towing means may be used on the ropes. Holding lines should be used to prevent damage to the vehicle from setting too rapidly. Before the vehicle is moved under its own power necessary oil and gas, battery and radiator water should be replaced, and a careful inspection should be made to determine the damage done.

Night Driving. Movements under cover of darkness are frequently necessary in order to escape observation and gain security. In forward areas, movements must be made without lights if casualties are to be minimized and secrecy preserved. Night movements are particularly difficult because of the limited control that can be exercised and the obstacles that must be overcome. Before such movements are undertaken, drivers should be given thorough training in marching, with and without lights.

Training in night driving should start with empty vehicles operated over good roads with lights. Careful instructions should be issued and the road should be well marked. After the drivers have become reasonably skilled in driving with lights, they should be required to traverse the same route without lights. Provision should be made to prevent flashing of the stop light. The routes traversed should become progressively more difficult until drivers are proficient in handling their vehicles under all probable operating conditions. During this training, special attention should be paid to march discipline, to the prevention of smoking, and the use of lights. When a movement with

lights is to be continued without lights, time should be allowed to accustom drivers' eyes to the changed conditions.

Loads and Loading. (Plate 45.) In order that vehicle capacity and cargo space may be efficiently used, it is necessary that drivers have a knowledge of loads and loading. The driver ordinarily should not be required to handle cargo during the loading and unloading operations, but he should be directly charged with the following responsibilities:

Maximum authorized load not exceeded unless ordered by proper authority. The maximum pay load, road and cross-country, and the maximum tow load are shown on the vehicle name and caution plate. These loads should not be exceeded except in case of emergency, and then only when specially authorized. Lack of knowledge of cargo weight is not an acceptable excuse for overloading. When scales are not available and cargo weight is unknown, adherence to the following general rule will prevent overloading: The position of the rear springs should be determined with the maximum authorized load. The position of the spring ends below this line indicates that the vehicle is overloaded.

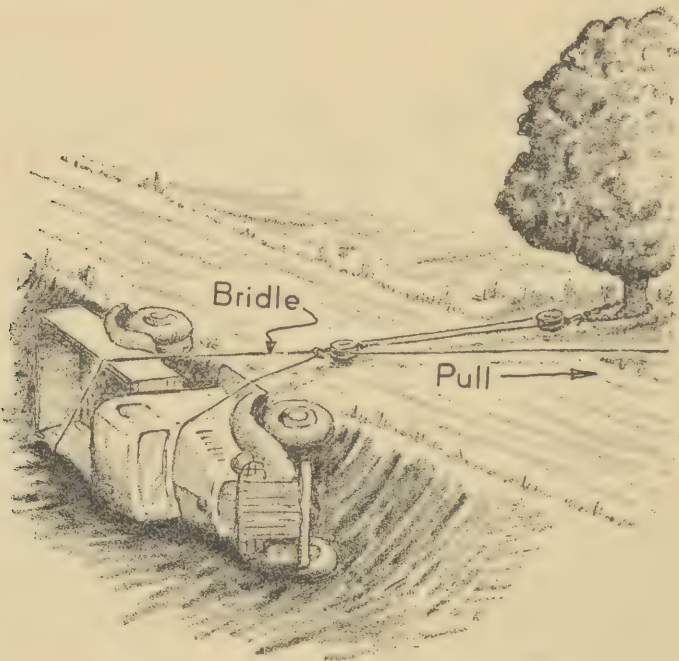


Plate 44. Righting an Overturned Vehicle.

Proper location and reasonable distribution within the body. Efficient loading insures maximum use of cargo-carrying capacity and safety in transit. One loose piece of cargo may release an entire load; and, if the load is unbalanced, the vehicle is in danger of overturning, is difficult to handle, and is a menace to traffic. The following principles should be observed for correct loading:

Heavy supplies should be placed at the bottom of the load and properly distributed.

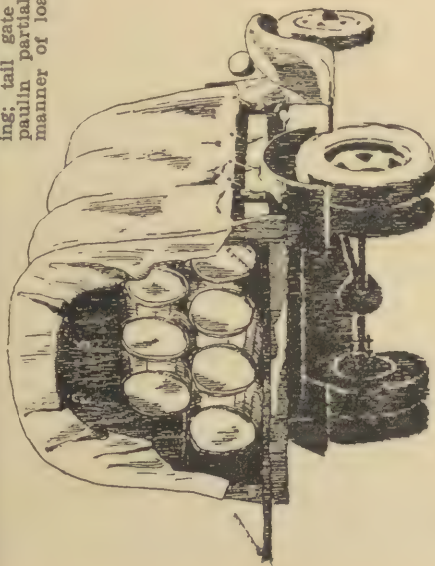
In building up the load, place cargo carefully to avoid shifting and distribute the weight equally on both sides of the body.

Loads should not be built up too high. High loads cause swaying and danger of overturning and make the vehicle hard to handle.

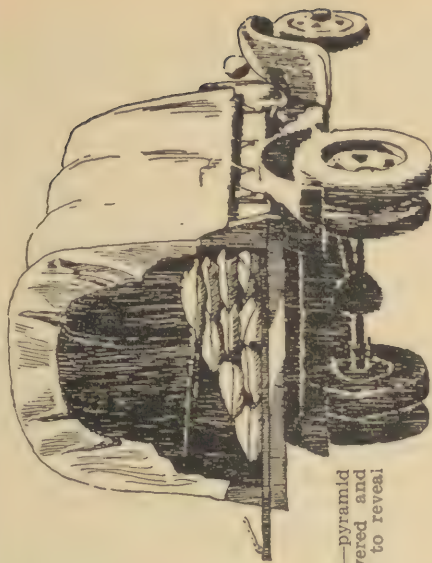
If the truck is not a covered vehicle, a tarpaulin should be placed over the cargo as a protection against sun, dust, or rain.

Proper security of the load to the body or to the pinle. Loads built up above the

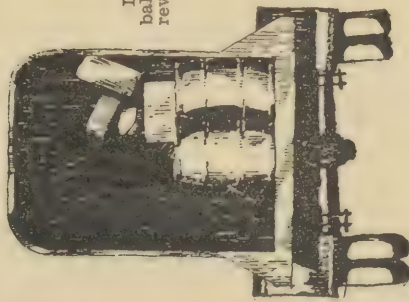
Headed barrels—pyramid loading; tail gate lowered and tarpaulin partially cut to reveal manner of loading.



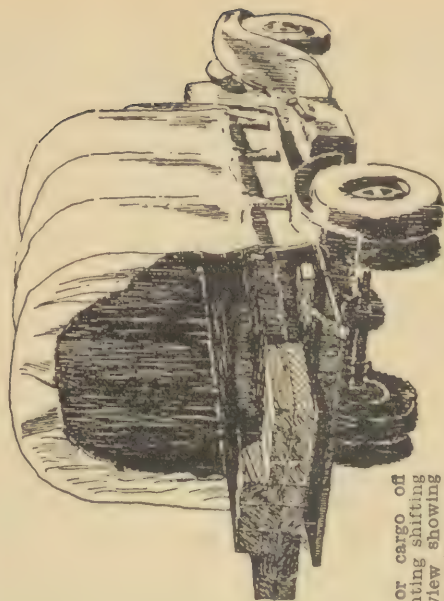
Bags and bundles—pyramid loading; tail gate lowered and tarpaulin partially cut to reveal manner of loading.



Improper loading—load not balanced; tail gate not shown to reveal details of loading.



Keeping weight or cargo off tail gate and preventing shifting of load; cutaway view showing load support inside vehicle.



top of the vehicle body should be securely lashed. The equipment for lashing loads on trucks consists of two 60-foot ropes which are sufficient for any ordinary cargo. Lash hooks or rings are usually provided on the bodies of cargo-carrying vehicles. The following procedure should be followed when lashing the load:

Fasten the end of one rope to one of the front lash hooks or rings.

Pass the rope diagonally across the top of the load, through or under the second rope support, and pull the rope tight.

Pass the rope diagonally back across the top of the load, through or under the third rope support, and pull the rope tight.

Continue the process until the rear of the truck has been reached and secure the end of the rope.

Using the second rope, start at the other front corner of the truck and repeat the procedure, using alternate lash hooks or rings.

Towed loads are attached to their prime movers or towing vehicles by means of the lunette on the towed load placed in a pintle on the towing vehicle. The pintle latch must be closed and secured before the load is moved.

Safety of the load in transit. After the load has been placed in or attached to his vehicle, the driver is responsible for its safety until the destination is reached.

Map Reading. Military motor vehicle drivers should receive sufficient instruction and training in map reading to enable them to follow routes on marked maps, to choose routes, and to recognize terrain features represented on topographic maps. Training should include the use of commercial highway maps, military topographic maps, airplane photographs, and mosaics.

Servicing. Servicing is defined as a check and necessary replenishment of gasoline, oil in crankcase, water or antifreeze in cooling system, and air in tires.

Precautions concerning the handling of gasoline must be rigidly enforced. When driver's trip tickets are used, the amount of gasoline should be entered on the ticket.

In the replenishment of oil in the crankcase, the following rules should be observed:

Take every precaution to prevent dust and other foreign matter from entering the crankcase with the oil. Wipe out the oil measure, the spigot on the oil drum, the funnel, and the oil filler pipe with a clean cloth before refill oil touches any of the surfaces.

Pour only the proper amount of oil into the crankcase. Do not overfill.

Use the proper grade of oil for the season.

Do not mix different makes of oil.

Wipe off any oil spilled during refilling.

When the driver's trip ticket is used, the driver enters on the ticket the amount of replacement oil used.

The water in the radiator should be maintained at the proper height below the overflow pipe. A hot engine should be allowed to cool before any considerable quantity of water is added to the radiator or the engine should be allowed to run and the water added very slowly. In freezing temperatures, if no antifreeze is used, care must be exercised to prevent freezing. When the cooling system must be drained, it is necessary in most engines that the cylinder block as well as the radiator be drained. Clean water, preferably soft, should be used to fill the cooling system. If conditions make it necessary to use dirty water, the cooling system should be drained, flushed, and refilled with clean water at the earliest opportunity.

Lubrication. (See also Chapter X). In decentralized lubrication, the driver should be held responsible for the lubrication of all parts that cannot be damaged by overlubrication except those requiring special lubricants. Parts that should be lubricated by the driver include spring and spring shackle bolts, spring pivot seats, steering knuckle pivots, steering knuckle tie rod pins, steering gear connecting rod (draglink) ends, clutch and brake pedal and brake lever pivots and linkage, accelerator linkage, door hinges and locks, tail gate hinges, and other slow motion friction surfaces.

Equipment furnished the driver includes a high pressure lubricator and an oilcan. The driver is responsible for the care and condition of this equipment.

Lubrication should be performed in accordance with a lubrication schedule and reports should be rendered by drivers when the lubrication is complete in order that proper records may be kept. Grease fittings and oil holes should be cleaned before lubricant is applied. Careful instruction and diligent supervision are necessary to assure good lubrication. Lubrication by the numbers is suggested as an effective method for teaching lubrication to untrained personnel.

Lubrication by drivers involves the use of only two types of lubricant: oil and chassis lubricant.

The oil used for lubrication of linkages, hinges, etc., should be of the same grade as that used in the engine crankcase.

The chassis lubricant used on spring and spring shackle bolts, steering knuckle pivots, etc., is of semifluid grease usually having a brilliant color and stringy consistency. Drivers must be taught to distinguish between chassis lubricant and other types of lubricants.

Tightening. The distinction between tightening and adjusting must be definitely understood, otherwise drivers will undertake operations which they do not have the knowledge, experience, or equipment to perform. In general, adjustment involves placing moving parts or assemblies in proper relative position and securing them in that position. Adjustments, except specified emergency adjustments, are prohibited to the driver.

When a driver discovers a loose or lost nut, bolt, screw, stud, or cotter key, he should tighten or replace it unless the adjustment of a part or assembly is affected. If adjustment is involved, report should be made to the chief of section or other designated individual.

A driver should be taught the correct use of the tools furnished for his use and the proper degree of tightness of the various nuts, bolts, and screws on his vehicle. If the drivers are not sufficiently skilled or if the proper tools are not furnished for their use, all tightening operations should be performed by the motor sergeant and mechanics.

Cleaning. A motor vehicle should be cleaned after operation to prevent hardening of dirt accumulations and to keep dust and other foreign particles from working into bearing surfaces. The body and exterior parts of the chassis should be washed, using a hose if available. Water should not be played on the engine as ignition troubles may result. Dirt should be wiped from the engine and its subunit assemblies. Gasoline should not be used to clean engines; cleaning solvent is recommended because of its greater safety. Gas and oil lines should *not* be polished. The use of paint on radiator cores is prohibited.

Vehicles should be inspected *before* being washed, because of the greater ease in detecting loose parts and assemblies, broken dust films being the best evidence of looseness. Scheduled lubrication should be performed *after* washing so that any water or dirt which has entered bearing surfaces may be forced out by the pressure of the new lubricant.

Care of Tools and Equipment. The driver is responsible that tools, spare parts, pioneer equipment, chains, traction devices, towing cables, paulins, and equipment furnished with his vehicle are in their proper places, are clean, and are in condition at all times for immediate use. Any equipment which becomes unserviceable should be repaired or replaced immediately. Shortages or unserviceable equipment should be reported to the chief of section or other designated individual.

Care of Tires. The chief responsibility of the driver in caring for tires is that of proper inflation. Tires should be inflated to recommended pressures and the pressure checked daily with a reliable gage. Air pressure cannot be determined satisfactorily by looking at the tire.

In general, tires should be removed from their wheels at least yearly to permit conditioning of wheel rim surfaces. Rim surfaces should be cleaned and covered with a protective coating to prevent rust. Wheels, including spares, should be changed periodically to secure uniform tire wear and to maintain resiliency in the spare tires.

When mounting tires on a motor vehicle, particular attention should be paid to

sizes. In general, tires should be mounted in pairs. That is, tires of equal outside diameter should be mounted on the front wheels and those of equal outside diameter on the rear wheels of a 4 x 2 vehicle. However, on an all-wheel-drive vehicle without a center differential or other compensating device, all tires should have the same outside diameter. In order to maintain this condition after tires become worn, it may be necessary to transfer tires from one vehicle to another.

When mounting dual tires, the worn tire should be placed on the inside. Tires differing more than one-half inch in outside diameter should not be mounted on the same wheel or on the same axle.

Drivers should be constantly alert to detect evidence of excessive or unusual tire wear. The most common causes of excessive tire wear are:

Improper inflation, including under and over inflation and bleeding.

Poor driving, including fast starting and stopping and improper use of brakes.

Rocks or other foreign material wedged between dual tires.

Misalinement.

Overloading and improper loading.

Improper sizing of tires (different sized tires on the same axle, etc.).

Care of Storage Battery. The motor vehicle driver should have a general knowledge of the functioning of a storage battery. He should know the correct ammeter reading for proper functioning of the generator and the general procedure to be followed when any abnormal reading is observed. He should know how to use the storage battery so as to prolong its period of usefulness. The following care by the driver should be routine:

Keep battery terminal connections clean and tight. Remove and clean corroded connections, using a weak alkaline solution if available. Dry the connections, apply a thin coating of vaseline or soft grease, replace and tighten the connections. Corroded terminal connections reduce storage battery efficiency and overload the generator.

Keep the battery clean and securely clamped in the battery carrier.

Inspect the height of the battery electrolyte each week during summer and each two weeks during winter seasons. If the electrolyte is below the prescribed level, report the fact to the chief of section or other designated individual.

Report any unusual performance or battery condition immediately.

Duties During Scheduled Maintenance and Technical Inspections. Before his vehicle is submitted for scheduled maintenance or technical inspection, the driver should correct such mechanical defects as are within the limits of his ability and the tools and equipment provided for his use. The vehicle should not be cleaned unless it is excessively dirty, since the dust film aids the mechanics in detecting defects.

The driver should report known mechanical defects which he is not authorized to correct and accompany his vehicle while it is undergoing scheduled maintenance or technical inspection in order to further his knowledge of the mechanical condition of the vehicle and to permit the motor officer, or his representative, to point out results of improper operation or vehicle abuse and take proper corrective action.

MARCHES

Characteristics of Motor Movements. The outstanding characteristics of modern motor movements are the tremendous distances over which immense tonnages may be transported and the great potential flexibility in the rates of march employed. The principal difficulties which such moves entail are those of control, communication, concealment, length of columns, vulnerability to attack, defense, and dependence on technically correct supply and maintenance systems.

Influence of Air and Mechanized Forces. The vulnerability of large-scale motor movements to aviation and the secrecy usually desired in such moves are frequently deciding factors in the selection of a suitable method of march. The threat of attack by hostile mechanized forces is to a lesser extent responsible for the march methods adopted.

March Discipline and Training. The very nature of modern motor movements, particularly the difficulties of control and communication, the sudden changes in orders,

and the high rate of movement, as well as the amount of discretion and responsibility which must be left to subordinate commanders and even drivers, makes necessary a high degree of march discipline and training.

Principal Elements of Motor Movements. Some or all of the following elements may be essential in the successful execution of motor movements:

In the selection of routes, avoiding stream lines, mountain passes, and similar terrain features which may be classified as natural bottle necks.

Provision of suitable detachments of engineer ponton trains and pioneer troops.

Provision of a suitable escort to protect against attack by aircraft or mechanized forces.

Adoption of a type of marching giving sufficient dispersion to avoid offering a profitable target whenever both air and ground escorts are insufficient to give air and ground superiority.

Use of multiple columns in marching.

Use of the necessary control personnel and plans to permit rapid rerouting of columns in case of emergency.

Use of concealed bivouac or assembly areas in which to commence and terminate each movement, utilizing the minimum number of halts.

Use of dispersed small bivouac or assembly areas.

Prevention of massing of vehicles, particularly at the initial point, during halts, and at the entrance to bivouac or assembly areas.

Measurement of distance in *time* rather than *space* in all staff planning.

Thorough ground and air reconnaissance, to the extent time permits, of contemplated routes to include search for possible mining of roads and bridges.

Provision of suitable radio equipment.

Provision of sufficient motor maintenance facilities.

Definitions. *Accordion action (whip).* The variation of distances and speeds of vehicles within a column during movement.

Arrival time. The time at which the head of a column, or specified element thereof, arrives at a designated point.

Clean-up party. Personnel under command of an officer who remain in camp after the departure of the main body to make the final police of camp.

Clearance time. The time at which the tail of a column, or specified element thereof, completes passage by a designated point.

Column. One or more march units, or serials, under one march commander, using the same route.

Column commander. The senior officer with the column or the person designated by him to exercise command.

Commander of troops. The officer in command of the unit being transported. He may be also the march or convoy commander.

Control car. The car which precedes a column, or element thereof, and sets the rate of march.

Control officer. An officer usually the executive or second in command, who rides at the head of a column, or element thereof, and regulates the rate of march.

Control point. A definite, easily identified and described reference location along a route of march, at which information and instructions are given in order to facilitate and regulate supply or traffic.

Convoy. A group of motor vehicles organized to operate as a column for the purpose of transporting non-organic troops or supplies, in contra-distinction to organically motorized tactical units or supply trains.

Convoy commander. The officer in charge of motor transportation and operating personnel of a convoy.

Distance. The space from the rear of one vehicle (including towed load, if any) to the front of the next vehicle in the column; or the space from the rear element of a march unit or serial to the leading element of the following march unit or serial.

Double banking. The act overtaking and passing, or parking or moving abreast of, other traffic headed in the same direction on a roadway.

Double staggered column. A two-lane column so arranged that the vehicles in one lane are opposite the spaces between vehicles in the other lane.

Entrucking point or detrucking point. An easily recognizable location where the head of a motor column, or element thereof, halts for the loading, or unloading, of troops or supplies.

Entrucking groups. Troops, matériel, or supplies properly disposed for loading at an entrucking point.

Escort. Troops detailed to prevent interference with a motor movement by hostile air forces, by mechanized or other ground forces, or by other traffic.

Guard. An individual placed at a danger point, such as a railroad crossing or a turn into or off a main road, to prevent traffic accidents.

Guide. An individual who leads or directs a unit or vehicle over a predetermined route or into a selected locality.

Headway. The interval of time between individual vehicles, march units, serials, or columns, measured from head to head as they pass a given point.

Initial point. An easily recognizable point at which a moving column, or element thereof, is formed by the successive arrival thereat of its various subdivisions.

Lead. Linear spacing between the heads of successive vehicles, serials, march units, or columns.

March discipline. That quality acquired through training and experience in marching which insures adequate march control; care of equipment; obedience to march restrictions; proper conduct and performance of duty by individuals; correct formations, distances, and speeds; and effective use of cover.

March graph. A time-space diagram used in planning and controlling marches and in preparing or checking march tables.

March order. An order issued by a commander, covering the details of a march.

March report. An official report submitted at the end of a march.

March table. A composite list showing the general organization and time and space schedule for a march movement.

March unit. One or more motor vehicles under a single commander for purposes of march control. A company, troop, battery, or similar organization normally forms the march unit.

Marker. An individual, distinctive sign, or notice placed at a critical location to indicate a position, direction, procedure, or obstacle.

Mobility. Facility of, or capacity for, movement.

Park. An area used for the purpose of servicing, maintaining, or parking vehicles.

Pioneer work. Rough, hasty construction or demolition tasks executed to facilitate the movement of friendly troops or to impede the movement of hostile troops.

Quartering party. Personnel, under the command of an officer, who precede the main body on the march and lay out the camp or make arrangements for shelter of the troops.

Rate of march. The average speed of a column over a period of time including short periodic halts.

Regulating point. An easily recognizable location where an incoming motor column, or element thereof, is separated into groups for movement to assembly or bivouac areas, or to entrucking or detrucking points.

Release point. A location at which specified elements of a column revert to control of their respective commanders.

Road block. Any obstacle which delays or prevents traffic movement on the road.

Road space. The total length of roadway occupied by a column or element thereof.

Road time. The total time a column or element thereof, requires to clear a given section of road. (Road time = time length + time-distance between ends of the given section of road).

Route marking party. Personnel used to mark the route and to control traffic at congested points along the selected route of march. The party precedes the march column and is usually commanded by an officer.

Serial. One or more march units, preferably with the same march characteristics, placed under one commander for march purposes.

Shuttling. A system for moving troops or supplies when more than one trip is required to complete the move.

Speed. A rate of travel, usually measured in miles per hour.

Speedometer multiplier. Any number by which the speedometer reading is multiplied to determine the lead (usually in yards) between vehicles in open column.

Strip map. A sketch or map, either schematic or drawn to scale, delineating a route to be followed.

Time-distance. The time required to move from one point to another.

Time-gap. The interval of time, measured from tail to head, between successive vehicles, march units, serials, or columns as they move past a fixed point.

Time length. The time required for a column, or element thereof, to pass a given point.

Traffic block. Any use of a section or roadway by vehicles or traffic which prevents the passage of other vehicles or traffic in a specified direction.

Traffic bottleneck. A section of traveled roadway having a greater traffic density or a smaller traffic capacity (capacity bottleneck) than that of the roadway or roadways leading thereto.

Traffic capacity. The maximum traffic flow attainable with close column marching on a given roadway, using all available lanes.

Traffic density. The number of vehicles per unit length of roadway (e.g. 75 vehicles per mile).

Traffic flow. The number of vehicles that pass a given point within a given period of time (e.g., 500 vehicles per lane per hour).

Trail car. The car carrying the trail officer.

Trail officer. An officer, usually the motor maintenance officer, who rides at the rear of a column, or element thereof.

Turn-around. A locality where the direction of march may be reversed.

Vehicle commander. Usually the senior officer or man riding in the vehicle.

TYPES OF MOVEMENTS

Infiltration (Type I). *Description.* Vehicles are dispatched individually or in small groups over a carefully marked route. Observation from the air should disclose what appears to be only normal or routine traffic.

Advantages. This type of march provides the best possible passive protection from hostile observation and attack. Under light traffic conditions, movement of individual vehicles is not affected materially by other vehicles in the column and is limited only by road conditions, vehicle mobility, and the training, experience, and physical condition of drivers. Thus, the rate of march is the highest practicable. Driver fatigue and the probability of accidents is reduced to a minimum. Since traffic density is normally very light, cross traffic can move without impeding the march. A traffic escort is not normally required, although intersection control may be desirable. Operating conditions resulting from the employment of the infiltration type of march approximate those to which individual drivers are accustomed in civilian traffic.

Disadvantages. Time length of column is greater than with any other type of march. Thus, in spite of a higher rate of march, the total road time for a column may be longer. Because of extended distances between vehicles, internal control of the column is extremely difficult. Since drivers are not always able to regulate their movements on the vehicle ahead, careful marking of the route is necessary to prevent individual vehicles from getting lost.

Uses. When sufficient time and road space are available, this type of march is used to provide the maximum of secrecy, deception, and dispersion as a means of passive protection against enemy observation and attack. It is therefore well suited to daylight marches in the combat zone. Because an infiltration column provides a minimum of interference with other traffic and a higher average rate of march, it is likewise suitable for non-tactical motor movements in peacetime.

Close Column (Type II). *Description.* In this type of march, the column is formed as compactly as practicable in order to reduce its time length to a minimum.

Advantages. For any given speed, time length and road space of column are reduced to the minimum practicable, and the full traffic capacity of the road can be utilized. Because of the small headways between vehicles, column control and intra-column communication are the best obtainable. An aerial escort or active antiaircraft protection can be utilized to maximum advantage. Since time length of column is reduced to the minimum, short moves may be completed before enemy air units have time to strike.

Disadvantages. This type of march does not provide dispersion for passive protection against enemy observation and attack. The strength and type of organization are readily apparent to hostile observation. In most cases, vehicles will arrive at terminal areas faster than they can be handled without producing congestion. Careful scheduling and rigid control of traffic are required if dangerous jams at intersections are to be avoided. Intercolumn interference is particularly troublesome and slows down the rate of march of the column.

Uses. Close column is used when a large volume of traffic must be moved over short distances in a minimum period of time. It is also applicable to short, high-speed movements from cover to cover when a minimum time of exposure may reduce the chances of discovery and attack. Normally, however, close column is not justified except when the column is protected by an aerial escort or is otherwise secure from hostile air attack. Close column may be useful for night moves under blackout conditions, particularly over poorly marked routes, when it is essential that distances between vehicles be short enough to enable drivers to maintain contact with and follow the vehicle ahead. This type of march may sometimes be used for peacetime movements through cities or other congested areas, providing a traffic escort is available, the move has been coordinated with civilian traffic authorities, and the movement is important enough to warrant delaying civilian traffic. Because of the excessive intracolumn interference produced by close column marching, close column should never be used when open column will provide the desired traffic flow.

Open Column (Type III). *Description.* This method is characterized by approximately constant headways at all speeds, and by intervehicular leads that vary directly with speed of movement. The spacing of vehicles is a compromise between the maximum and minimum leads employed in march types I and II, respectively.

Advantages. Open column provides the best possible compromise between the conflicting requirements of a large traffic flow (or short time length of column) and a wide dispersion of vehicles within the column. Intracolumn interference is minimized, and the rate of march is practically as high as in infiltration marching. Column control is not as good as with close column, but is much superior to that obtainable by infiltration. Driver fatigue and probability of accident is much less pronounced than in close column marching. Because time interval between vehicles is greater than in close column, it is easier to direct units to alternate routes in an emergency. On dusty roads, open column gives drivers better vision and better control of their vehicles than if close column were used.

Disadvantages. Because of the relative regularity of vehicle spacing, little secrecy is possible in moves of this type during daylight, and more losses will be suffered during aerial and mechanized attacks than will be the case with an infiltration column. Intervehicular headways in an open column are generally longer than in close column, and consequently the full traffic capacity of the road is not utilized. Other traffic may be delayed, since headways are smaller than in infiltration marching and may not be sufficient to permit such traffic to pass through the column. Driver fatigue is greater than when infiltration marching is used, and drivers must be trained to estimate and maintain the variable leads required.

Uses. Open column is particularly applicable to tactical moves which must be made during daylight without aerial escort and when time is so important that lack of secrecy and reasonable losses from attacks are acceptable. Sufficient dispersion may usually be prescribed to prevent simultaneous shelling or bombing of two or more vehicles. Open column may be used to advantage when moving with driving lights at night, or with

blackout lights on moonlight nights. It is likewise applicable to non-tactical peacetime marches if drivers must depend on vehicle ahead for route guidance, or when volume of traffic to be moved precludes the use of infiltration march.

Shuttling. When repeated trips of the same vehicles are required in order to transport troops or supplies, a system of movement known as *shuttling* is employed. Any of the foregoing types of march, depending on traffic and tactical conditions, may be used for shuttling. This system is not well suited for the movement of troops to an area in which combat is imminent unless the force moved in the first trip is capable of sustained combat pending arrival of remainder of unit. The dumping of organic cargoes in order to move foot troops by shuttling, must be limited to those supplies not immediately needed in combat area. Terminals are selected so as to provide adequate turn-around facilities. The preparation of entrucking and detrucking tables will help eliminate delay and confusion at terminals; and the march graph will assist in scheduling the movement.

MARCH TECHNIQUE

Mechanics of Column Movement. *General.* Whenever the tactical situation permits, a march column should be made up of vehicles with similar march characteristics, even if this requires the temporary separation of a tactical unit into two or more independent columns.

When the tactical situation demands that a column be composed of vehicles with different march characteristics; the rate of march of the column is governed by the performance of the slowest vehicle. For march control purposes, *it is usually desirable to place the slowest vehicle at the head of the column.*

Speed variance within the column. It is theoretically possible for an entire motor column to move at a constant speed. Practically, however, a column of any length will cover simultaneously many diverse stretches of road and incidents of terrain, including hills, sharp curves, dust clouds, and varying road surfaces. The result is that different parts of the column, regardless of traffic conditions and vehicle performance characteristics, move simultaneously at different speeds. This produces accordion-like action, and on a long hill or bad stretch of road, serious conditions may result. On the near side of the obstruction, a long and constantly increasing mass of vehicles will accumulate and on the far side, the column will be elongated (Plate 46, Fig. 1).

Solution to problem of column movement at varying speeds. A long column can be held together under such conditions only by continuously adjusting the speed of the control car, and every succeeding vehicle in the column, to that of the vehicle moving at the slowest speed. Column compactness, if that is desired, can be attained only by sacrificing high rates of march. If compactness is not essential, *the ideal type of column movement should be such as to permit each vehicle to pass over any given stretch of road at the same speed as the control car.* This ideal can be approached by varying intervehicular distances to produce constant headways throughout the column at all speeds. (See Plate 46, Fig. 2) When this is done the rate of traffic flow up to a section of road, which must be traversed at a reduced speed, is made equivalent to the rate of traffic flow over and away from this section of road. Intracolumn interference is thereby eliminated, and every vehicle in the column is enabled to move as rapidly as if there were no other vehicles on the road.

In picking up speed after leaving the traffic bottleneck, the control car should *increase its speed gradually*, in order to mitigate the accordion action. If fixed intervehicular distances had been maintained by the column shown in Plate 48, figure 2, the entire column would have been forced to slow down as soon as the first vehicle began to ascend the hill. The slow movement would then have been continued until the last vehicle had completed its ascension of the hill. For a column 20 miles long, the result would have been to reduce the speed of every vehicle from 30 to 10 miles per hour over a road distance of 20 miles. With the type of column movement actually shown in Plate 48, figure 2, on the other hand, the rate of march of each vehicle is reduced from 30 miles per hour to 10 miles per hour only while ascending the hill. The nearer the approach to constant headways throughout the column, the nearer will be the approach to the ideal type of column movement.

Infiltration. The route of march must be carefully marked, and every driver and front seat passenger should be given detailed instructions regarding it. A strip map should be provided for each vehicle. Complete operating instructions to include running speed, maximum speed, and restrictions on passing should be issued. Vehicles should be dispatched individually or in small groups of not more than 3 to 5 vehicles, and there should be no massing of vehicles which might disclose the movement to enemy observers.

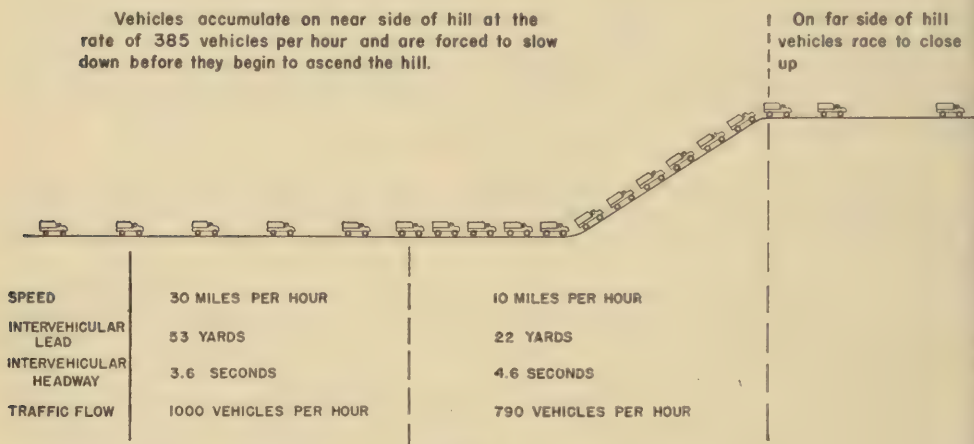


Figure 1.

Traffic flow is the same toward, through, and away from the hill. Therefore vehicles do not accumulate on the near side

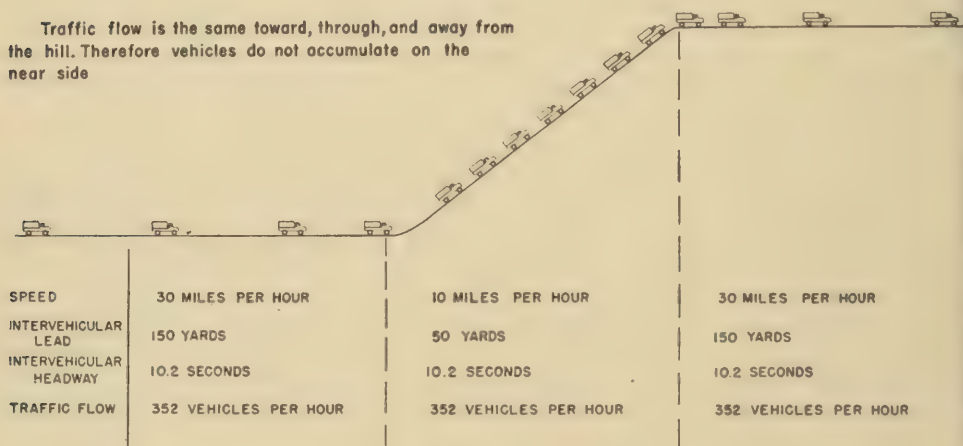


Figure 2.

Plate 46. Column Movements.

Deception may be further provided by intermingling various types of vehicles and by permitting passing within the column. In order to provide passive protection from enemy observation and attack, vehicles should normally be dispatched so as to produce an average traffic density (so far as the vehicles in the column are concerned) of not to exceed 5 vehicles per mile. When more than one movement is taking place simultaneously over the same route, it may be necessary to coordinate the rates of dispatch in order to obtain desired dispersion. Dispatching is normally effected by company, troop, battery, or similar unit in accordance with the plan of the column commander. Staff control can be exercised at the initial point, but movements up to the initial point must be planned so as to avoid an excessive concentration of vehicles near this point.

Average headways between vehicles are determined initially by the rate at which vehicles are dispatched; thereafter, speeds and headways are regulated by individual drivers in conformity with operating instructions. These may include the use of a prescribed speedometer multiplier (open column marching) when slower speeds occur en route or minimum leads to avoid presenting remunerative targets from the air, orders of the vehicle commander, and instructions of traffic personnel. If it should become necessary for any part of the column to halt on the road, vehicles should stop and pull off the road as soon as need for the halt is detected, and if possible, maintain distances of not less than 100 yards. Supervision of movement is affected by stationing necessary control personnel along the route of march. In order to prevent massing of vehicles at or near the march destination, it is important that adequate guides and markers be posted to insure that vehicles disperse to their assigned areas with minimum delay.

Close Column. When time and road space permit, sufficient headways (1 to 3 minutes added to the time length of the preceding serial or march unit is normally ample) are prescribed between serials and march units to localize intracolumn interference, allow reasonably smooth marching, and provide a faster rate of march. If time or available road space makes it impracticable to divide the column into serials and march units, the entire column moves in one compact group as a single march unit (the so-called "follow me" method of marching). Within each march unit, drivers are instructed to follow the vehicle ahead as closely as they think is reasonable and consistent with safe driving practices. For purposes of safety, a maximum speed (greater than the average running speed) is prescribed for vehicles regaining lost distances. Changes in speed should always be accomplished smoothly and gradually in order to insure safety and uniformity of column movement. At the halt, unless the tactical situation prohibits congestion, vehicles within each march unit should close up to a distance of approximately one yard between bumpers. March units and serials, however, do not close on the units ahead. If a multiple lane road is available for a movement in a single direction, any number of lanes may be employed. However, since vehicles in a close column operate at minimum headways possible, there can be no weaving or interchange of traffic between lanes. A traffic escort is necessary when close column marching is used.

Open Column. In order to give drivers a practical means of maintaining approximately constant time intervals or headways, at all speeds, the leads in yards between vehicles in the column are indicated as the *product of the speedometer reading by a specified number called the speedometer multiplier (sm)*. For example, the column commander might announce that the lead between vehicles will be twice the speedometer reading. At slower speeds and with smaller speedometer multipliers, it is impossible to maintain the small leads necessary to provide constant headways; at higher speeds and with larger speedometer multipliers, intervehicular leads become so large that it is difficult for drivers to estimate them accurately. Whenever the former situation occurs during a march, drivers operate their vehicles as they would in a close column (unless dispersion is sought, in which event vehicles will not approach closer to other vehicles than a minimum prescribed distance); when the latter occurs, drivers should operate their vehicles as they would in an infiltration column until the preceding vehicle slows down sufficiently to permit resumption of reasonably accurate estimates of intervehicular distances.

The selection of a specific speedometer multiplier for any particular stretch of roadway will ordinarily require a compromise between two mutually conflicting requirements. In the first place, it is desirable to increase intervehicular leads so as to avoid presenting a concentrated target to enemy attack. It is particularly desirable that vehicles never approach closer to each other on the road than the maximum diameter of the effective burst area of a shell or light bomb. (This diameter will generally not exceed 30 to 50 yards). In the second place, it is often necessary to reduce intervehicular leads in order to facilitate column control, decrease road time, minimize delay to cross traffic, or increase traffic flow through bottlenecks.

Since intervehicular lead in open column marching varies directly as speed, the

stretch of road at which the slowest speed occurs is the one which is critical in so far as dispersion of vehicles in the column is concerned. (Momentary halts or reductions in speed may be disregarded.) Hence, it is necessary to base the selection of a speedometer multiplier on the slowest speed expected between halts. Thus,

$$\text{speedometer multiplier} = \frac{\text{desired minimum intervehicular lead}}{\text{slowest speed expected between halts}}$$

For example, as a result of careful consideration of the requirements affecting the selection of speedometer multipliers as indicated in subparagraph *b.* above, it is decided that vehicles should not approach closer than 35 yards. The slowest speed expected during the next stage of an open column march is 10 miles per hour. Vehicles average 7 yards in length. The highest speed expected is 30 miles per hour. It is obvious that if an intervehicular lead of at least 42 yards is maintained at 10 miles per hour, sufficient lead will be provided at all speeds greater than 10 miles per hour. Hence, the speedometer multiplier in this case should be 42/10 or 4. A speedometer multiplier of 5 would be prescribed. At 30 miles per hour intervehicular lead will be 150 yards. If prescribed maximum time length of column will be exceeded by use of speedometer multiplier, a smaller *sm*, which will produce desired time length, is designated. It is often advisable to prescribe a minimum distance beyond which vehicles will not close either at the halt or while the column is in motion.

In order to localize intracolumn interference resulting from inaccurate maintenance of intervehicular headways, it is desirable to have serials and march units move a specified number of minutes behind the head of the column. Vehicles do not close up at the halt, but stop with approximately the same spacing between vehicles as was being maintained just before the halt was executed.

If it becomes necessary or desirable to reduce the time length of a march unit while it is in motion, the march unit commander can indicate a smaller speedometer multiplier. When this is done, the head of the march unit should slow down or stop until the tail of the unit has been able to close up sufficiently to observe the smaller speedometer multiplier. This time should be approximately equal to the desired reduction in time length. When it becomes necessary or desirable to increase the time length, this may be accomplished by indicating a larger speedometer multiplier. Before the time-length is increased, the march unit commander should make certain that there is sufficient time-interval between the rear of his unit and the head of the following unit to absorb the increase. The march unit control car should then continue the march at the fastest safe speed, each following vehicle slowing down until it is following the car ahead by the desired distance.

When protective dispersion is not necessary (*e.g.*, during peacetime marches or under conditions of friendly air superiority) a doubled staggered formation may be used.

A traffic escort is required for an open column, except where other traffic on the route of march is light.

Shuttling. There are two general methods by which shuttling may be performed. In the first method, troops or supplies may be transported over the entire distance between the origin and the final destination. This is the normal method of shuttling and the only method applicable to the movement of supplies. It is easy on the troops to be moved, and it eliminates uncertainty in making contact with troops once they start out on the road on foot. Total time required for shuttling by this method is somewhat greater than by other methods, but in most tactical movements time saved by having troops march part of the way on foot is negligible and usually does not justify the complicated planning required.

Sometimes it may be desirable to have troops march part of the way on foot. In this case, the truck column on its first trip will stop short of the destination at a previously reconnoitered turn-around. The troops detruck and march the remaining distance on foot. Meanwhile the troops to be transported on the second trip start off on foot as soon as the truck column clears the original entrucking point with its first load. The trucks which transported the first load of troops, after turning around, then move back along the line of march or on parallel routes, pick up the second load of troops,

and transport them to a second detrucking point nearer to the destination than was the first. The process is continued until the last load is picked up and transported to the final destination.

This latter method of shuttling has the advantage of reducing the total time required for the movement and truck mileage with consequent savings in gas and oil. Its disadvantages are lack of simplicity and greater troop fatigue. This shuttling procedure may be varied by having the truck column return all the way to the origin to pick up loads after discharging preceding loads at previously reconnoitered turn-arounds short of the destination; or by having the truck column transport the first load direct from the origin to the destination and on the subsequent trips proceed all the way to the destination after picking up troops who have meanwhile proceeded on foot along the route of march.

ORGANIZATION FOR A MARCH

Command. *Organic motorized tactical units.* Movements of organic motorized tactical units are made under the direction and supervision of unit commanders.

Organic motorized trains. Organic motorized trains carrying equipment and supplies likewise move under the direction and supervision of the train commander who is the senior officer or noncommissioned officer present in the units comprising the train.

Nonorganic vehicles. Movements of troops in vehicles that are not a part of their unit equipment are usually commanded by the senior troop commander present. His staff acts as a convoy staff. The motor-transport officer acts as a member of the commander's technical staff. However, if the troop movement is being handled by the staff of a higher headquarters as a part of a large move, the arrangement is usually as follows:

The transportation units are organized, staffed, and commanded on orders issued by the higher headquarters.

The convoy commander moves his vehicles to previously planned entrucking points. He is responsible for the technical operation of the transportation and the movement of the column. Orders to the convoy-operating personnel will be given only by the convoy commander and his assistants.

The commander of troops will exercise no control over the operations of the column except in a tactical emergency. He is responsible for the administration and discipline of the troops transported.

Command and Staff of a Convoy. The commander of a motorized regiment or other large convoy should be assisted by competent staff officers in handling the details of the movement. He may designate a staff officer, usually the executive officer, as **convoy commander**. Ordinarily, the following staff should be employed:

Adjutant. The adjutant handles the routine administrative paper work and the mail service.

Operations officer. The operations officer handles details connected with the actual operations of the convoy, such as preparing plans, march tables, march graphs, and drafts of move orders.

Supply officer. The supply officer handles details of supply except those for which the mess officer is responsible. He may be charged also with responsibility for cargo loads. In general, he handles fuels, lubricants, spare parts, clothing, and equipment.

Mess officer. A mess officer is usually detailed when all messing facilities for the convoy are to be consolidated.

Advance agent. An advance agent (or reconnaissance officer) handles all advance arrangements. He makes reconnaissance, locates detours, selects alternate routes when necessary, and posts markers. He also provides for billeting or bivouac of troops at destination.

Maintenance officer. The maintenance officer is the technical inspector responsible for the mechanical and operating condition of the rolling equipment.

Classification of Convoys. Convoys may be classified as follows:

According to their loads, they are known as *troop or supply convoys*.

According to their type of vehicles they are classified as *light, medium, or heavy convoys*.

According to the service of their vehicles, they may be classified as—

Train convoys made up from trains.

Provisional convoys made up from either military vehicles not ordinarily formed as such, or vehicles from nonmilitary sources.

Organization of Motor Movements. In motor movements of both tactical units and convoys in the combat zone, the organization into columns, serials, and march units is determined by the mission, the tactical situation, the road net, and the equipment of the units concerned. Logistical considerations, for instance, may dictate the separation of tactical units into speed columns and heavy columns.

Considerations. The type of march to suit the tactical situation may affect the organization of the movement. For instance, secrecy may dictate a movement by infiltration where identity of units is sacrificed.

Action imminent. Whenever a move terminates in areas where action is imminent tactical organization takes precedence over all other considerations. Here the cohesion and unity of action possible only to an organization knit together by association and arduous training become all important.

Variations. With the many variations of march organization open to the staff planning the move, the final choice should be made only after a careful study of the particular situation.

Details. The details given below must be considered in planning a motor movement. Depending on the conditions under which any particular movement is made, it may be practicable to combine one or more of the groups outlined.

Reconnaissance Party. Where practicable, reconnaissance prior to any motor movement is advisable.

Pioneer Work. The necessary pioneer work in preparing the route is usually accomplished by engineer troops. Lacking these, this important work must be performed by the units making the march. The requirements for this work vary greatly. They are negligible when moving over primary highways but become extremely heavy when moving over routes recently in possession of the enemy. In any case an estimate must be made of the necessary personnel, tools, material, and time for elimination and reduction of obstacles.

Equipment. Personnel and equipment for pioneer parties are based on an estimate of the road work that will be required.

Each vehicle in the military service should carry some pioneer tools and equipment to assist in crossing difficult terrain. These will vary according to Tables of Basic Allowances. In general, the allowances will permit the following equipment per vehicle:

- 1 pick
- 1 shovel
- 1 tow chain or cable
- 1 prolonge
- 1 axe
- 1 bucket
- 1 set skid chains
- 1 set wheel lugs, improvised grouser ropes, or other traction device

One or more vehicles in a march unit should carry additional equipment for the pioneer party. This equipment is usually carried on the trouble trucks of organizations not equipped with transportation for this purpose. The following will serve as a guide for loading a pioneer truck:

- 1 winch with 300 feet of cable (or equivalent block and tackle if winch is not available)
- 2 towing bars
- 2 shovels
- 1 pick
- 2 axes
- 1 sledge

- 2 heavy iron stakes or crowbars (about 4 feet)
- 1 rectangular log block (suitable for deadman, or wheel block) having two chains attached, long enough to fasten to tow hooks or body frame so that it cannot be rolled over when used to block wheels
- 300 feet 12-gage wire
- 1 saw, crosscut, 2-man
- 2 tow chains (about 15 feet)
- 1 block and tackle (with 300 feet 1-inch rope)
- 4 wheel mats, rope or canvas
- 2 prolonges
- 2 I-beams large enough to be used as stringers across an 8-foot span, or enough planks or other bridging materials for the same purpose
- 1 $\frac{3}{8}$ -inch or larger cable 300 feet long
- 500 pounds decontaminating material
- 1 apparatus, demustardizing

Duties. The principal operations performed by a pioneer party are as follows:

Large obstacles such as rocks, logs, stumps, trees, and holes which cannot be detoured are eliminated.

Soft surfaces such as sand, marshes, or loose soil are strengthened by covering with logs, planks, brush, rocks, wheel mats, cornstalks, hay, or like materials. Sand may be covered with chicken netting or tar paper.

Ice-covered winter roads are covered with sand or dirt.

Ravines and ditches are made passable by breaking down steep banks sufficiently so that running boards, lower parts of the chassis, overhanging front or rear portion of the body, or the spade of a towed gun trail will not hang on the banks. When wet, the bottoms of ditches are strengthened to withstand the wheel impact and spin of heavy vehicles. Logs, rocks, brush, sacks of dirt, etc., are used to fill in; planks or logs are used to bridge across. These materials are secured so that they cannot be displaced.

Shallow stream crossings with good approaches and solid bottoms are chosen. Steep approaches are cleared straight down so that there will be no danger of side slipping. Traction is increased where banks are soft or slippery. If this cannot be done sufficiently with brush, hay, etc., ramps may be built with poles. Loose dirt is never added on slippery approaches, in holes, or on steep ascents, because it reduces traction. Rocky creek bottoms are checked carefully against dangerous obstructions. If there are holes or if the bottom is soft, rocks, brush in fascines, or logs are used to fill in and increase flotation.

On steep ascents or descents or where a deep crossing is required tackle is placed in position.

Bridges which are found to be weak are usually strengthened by the addition of a bent, a single support, or stringers. Where there is danger of loads breaking through the flooring, additional planks are laid along the wheel tracks to distribute the load. Joints are staggered and planks are nailed down. Wheel guides of heavy timbers, ties, or poles are secured near the safe edge of the bridge to prevent vehicles from running off. (Plate 47.)

Rafts are usually built for crossing navigable waters where bridges, engineer equipment, or commercial ferries are not available. Simple rafts large enough to ferry trucks and their towed loads can be built from boats, oil drums, logs, and timbers. Twenty-five 50-gallon drums floated between the cross timbers of a platform will give a capacity of about 10,000 pounds. The outside or end drums may best be lashed to the platform. Care must be taken that the drums are sealed. In crossing a flowing stream a raft may best be utilized as either a trail or flying ferry. In the first method the raft is attached so it will slide long a cable which is run across the river and fastened to either bank. In streams where the current is faster the raft is attached to a long cable which is anchored upstream. In either method ropes are attached from both shores to pull the ferry back and forth.

Barbed-wire entanglements are cut out and towed away by means of a smooth wire or chain passed around them. In an emergency a truck can go through entanglements under 4 feet high with a fairly good chance of success but with some damage.

Sections of road and bridges which have been sprayed with persistent chemical agents are decontaminated. Where decontamination is not immediately practicable, detours are selected.

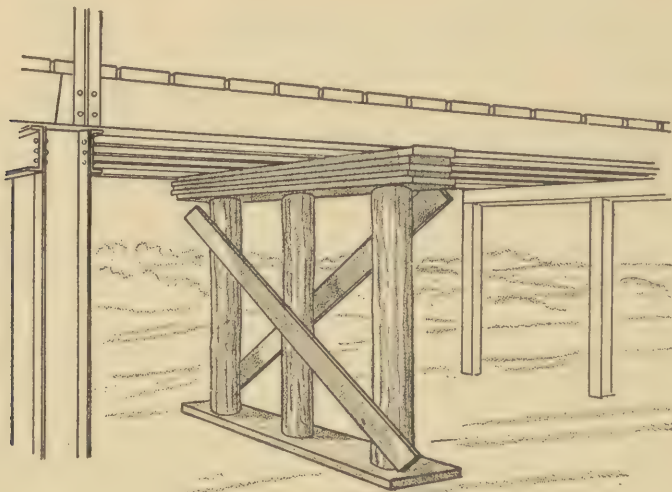


Figure 1. Bent.

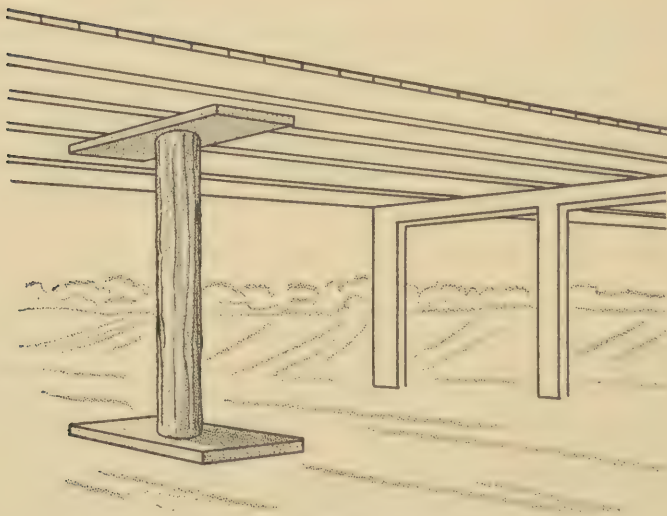


Figure 2. Single Support.
Plate 47. Reinforcing Bridges.

Route Marking. Proper route marking, especially if the infiltration type of march is employed, is important. Even though the primary highway signs, flags, and luminous markers have their proper uses, a certain amount of personnel is usually necessary for marking the route. The detail should be carefully organized and instructed.

Traffic Control. To provide for such contingencies as bombing of bridges, artillery

fire, and changes in orders, all of which necessitate rapid rerouting, a series of control points interconnected by communication may be necessary. Under other circumstances, traffic personnel such as military police and motorcycle messengers may be required to supplement the route marking detail.

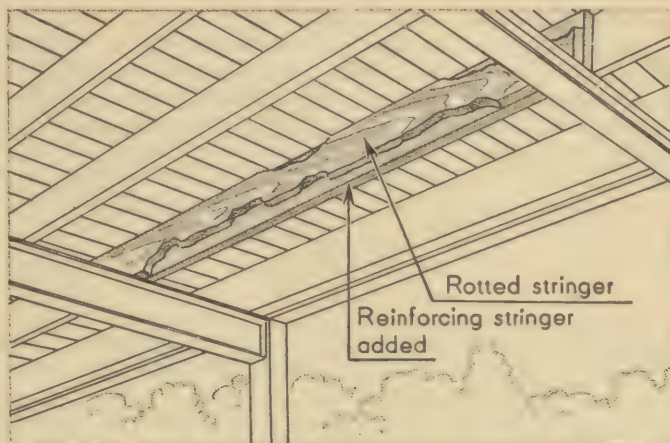


Figure 3. Added Stringer.

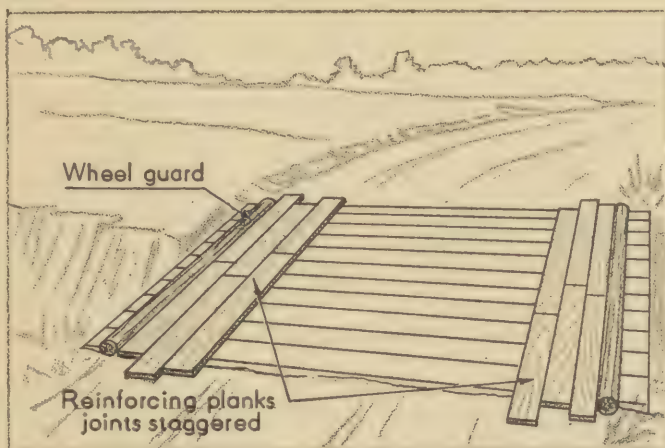


Figure 4. Additional Planking and Wheel Guards.

Plate 47. Reinforcing Bridges—Continued.

Quartermaster Party. The early dispatch of a quartermaster party is important. Its mission is to lay out the bivouac or assembly areas at the march destination and to guide units as they arrive at a selected release point to these exact areas. It also prepares a plan for suitable disposal of available antitank weapons for the antitank defense of the area, as well as similar provisions for the antiaircraft defense. Suitable personnel for this party usually include an assistant S-3 and one other officer from the battalion staff, an agent or guide from each company or battery, and the necessary enlisted men, drivers, and mechanics. In moves of a division, regimental representatives only will be required.

Command and Communication. The exercise of command over a long, fast-moving motor column is difficult compared to that of columns composed of foot elements and animals. The sudden attacks to which it is subject and the destruction of bridges and

roads all combine to make reliable communication agencies a necessity. When the tactical situation prohibits the use of radio, airplanes and motor messengers must be depended upon for transmission of orders. When the use of radio is permissible, provision should be made to make full advantage of it.

A chain of control points connected by radio or commercial telephone or telegraph is often a necessity, particularly when infiltration moves are in progress. Traffic personnel may also be employed to assist in communication. Two command echelons should be organized. The forward echelon should consist of the column commander, part of his headquarters personnel, and representatives from each battalion or similar unit. In moves of a division, regimental representatives only would be required. The commander with his echelon is free to move where he chooses. Because of the length of the column, it is usually impossible for him to make passages of the column, and his echelon will usually be found near the head of the column. In certain situations he may move directly to the new assembly area. It is important that he be far enough to the front to render decisions as the situation requires.

The second echelon will consist of the executive officer, the remainder of the headquarters staff not elsewhere employed, and representatives from each subordinate unit. The second echelon, in case of marches of the infiltration type, will at first supervise the dispatch of vehicles and later patrol a sufficient part of the route or routes to insure proper movement of vehicles. In movement of a column or columns the executive or his representatives will ride in control cars at the heads of columns, directing the speed and routes to be followed. This group is also responsible that the time the control car passes markers or prominent landmarks is made known to march unit commanders every 15 to 20 minutes, either by use of radio, time blackboards, or announcement by the marker by voice. Their other duties are to take charge of the arrangements for any unforeseen detouring, to take necessary action in case of mechanized or aircraft attack, to superintend the halting and refueling of the columns, and to enforce march discipline.

Evacuation of Bivouac Areas and Supervision of the Tail of Columns. The proper supervision of evacuation of bivouac areas and of the rear of moving columns must be delegated to specified officers and men, since the length and speed of columns prevent these functions from being executed by members of the column proper.

Clean-up party. Sufficient personnel to inspect bivouac areas and halt sites after they are vacated by the column and to correct and report any deficiencies must be provided. In peacetime where camp sites are leased, it would be the function of the officer with this party to complete the necessary paper work with the property owners.

Salvage of disabled vehicles. Another function of this group is the salvage of disabled vehicles.

After completing his duties at the bivouac areas, the officer in charge and his detail join the tail of the column or columns just ahead of the motor maintenance section. His duties then are the investigation of accidents en route, and the inspection of damage to roads and bridges in peacetime.

Trail officers. The column (serial or march unit) trail officer marches at the rear of the column (or element thereof). His job requires considerable skill and good judgment, as well as a thorough knowledge of motor transport technique. For this reason, an experienced motor officer or transport officer is usually selected. Trail officers usually perform the following duties:

Dispatch individual vehicles, march units, or serials from the column (serial or march unit) initial point.

Report location of tail of column (or element thereof) to their respective control officers when called on to do so.

Inspect disabled vehicles and decide whether to abandon them or take them in tow.

Note infractions of march discipline, and when necessary take immediate corrective action.

Prevent vehicles or other columns from passing from the rear whenever this operation presents a traffic hazard.

When column halts, post necessary guards, warning flags, caution lights, or flares to warn traffic approaching from the rear.

The column trail officer picks up and, as soon as practicable, returns to the head of the column all guides and markers distributed by preceding elements of the column.

Escorts. Air and ground escorts to guard against air and mechanized attacks are provided for in the original plan. In the plans for antimechanized defense it may become necessary to reorganize all units present which are capable of antitank defense by splitting them up and inserting sections in column intervals.

Daily Time Schedule. In day to day operation of a motor convoy, the following may be considered as a reasonable guide and schedule:

Preparation for starting (includes reveille, breakfast, breaking camp, police of area) and vehicle inspection 1 hour.
 Operating or running time (includes all halts, except noon meals) 8 hours.
 Refueling and servicing vehicles and noon meal 1 hour.
 At destination; inspecting and servicing vehicles, making camp, and supper 2 hours.

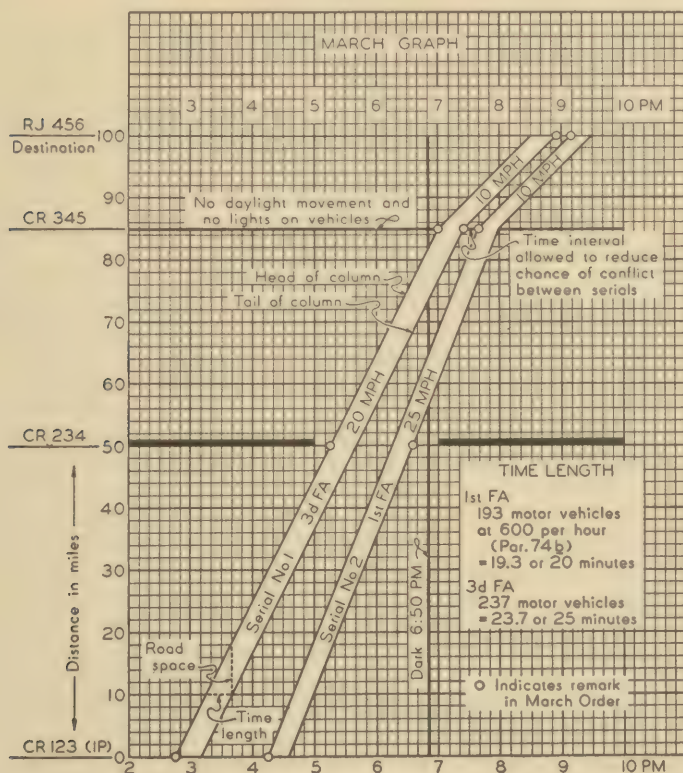


Plate 48. March Graph.

It is noted that motor personnel operating convoys on a day to day basis must have about 4 hours for starting, for meals and refueling, for inspection and servicing, and for settling at the new camp sit or bivouac. Loading and unloading time for cargo is not included.

March Graph. To avoid physical fatigue of operating personnel with all the harmful effects that may arise, such as traffic congestion, accidents, lack of alertness, vehicle damages, troops not being in condition, etc., it is advisable to plan the daily operating schedule so as to avoid unduly long hours of operations. A march graph (Plate 48) should be prepared for any day's run, showing daily estimated mileage and probable

operating time. This graph, when used also to plot actual mileage and operating time, furnishes an instantaneous comparison of actual mileage and running time with original estimates.

Halts. Halts en route are usually made to provide for physical relief of personnel, for a check of gasoline, oil, and water of vehicles, and for making such mechanical adjustments or corrections as may be advisable. Usually these road halts are made for about 15 minutes after the first hour from initial point (or point of origin) and for about 10 minutes every two hours thereafter.

Selection of the places for halting must consider availability of wooded or sheltered areas, avoiding stops or grades, turns, and curves, possibility of enemy action, and condition of troops.

CHAPTER XII

MILITARY COURTESY AND DISCIPLINE

DISCIPLINE

General. *a.* Military discipline is intelligent, willing, and cheerful obedience to the will of the leader. Its basis rests on the voluntary subordination of the individual to the welfare of the group.

Discipline is the cohesive force that binds the members of a unit, and its strict enforcement is a benefit for all. Its constraint must be felt not so much in the fear of punishment which it evokes as in the moral obligation it imposes on the individual to heed the common interest of the group. (*Par. 106, FM 100-5*).

b. Discipline establishes a state of mind which produces proper action and prompt cooperation under all circumstances, regardless of obstacles. It creates in the individual a desire and determination to undertake and accomplish any mission assigned by the leader.

c. Acceptance of the authority of a leader does not mean that the individual soldier surrenders all freedom of action or that he has no individual responsibility. The American system of discipline calls for active cooperation from the subordinate.

d. True military discipline extends far deeper than and beyond mere outward sign. For example, proper dress and smartness of appearance, while desirable and conducive to good discipline, are not alone conclusive proof of *true* discipline. *A more likely indication is the behavior of individuals or units away from the presence or guidance of their superiors.*

Importance. *a.* Man is and always will be the vital element in war. As an individual, he is most valuable when he has developed a strong moral fiber, self-respect, self-reliance, self-confidence, and confidence in his comrades. A feeling of unity must be achieved if the group of individuals is to function as a unit instead of a mob. Modern warfare requires self-reliance in every grade; individuals capable of independent thought and action, who are inspired by a distinct feeling that as an individual or as members of a unit they are competent to cope with any condition, situation, or adversary.

In spite of the advances in technique, the worth of the *individual* man is still decisive. His importance has risen due to the open order of combat. Every individual must be trained to exploit a situation with energy and boldness, imbued with the idea that success will depend upon his action. (*Par. 102, FM 100-5*).

b. The ultimate purpose of all military training is effectiveness in battle. Only well-disciplined troops exercising cooperative and coordinated effort can win. Without proper discipline, a group of men is incapable of organized and sustained effort.

The dispersion of troops in battle, caused by the influence of modern weapons, makes control more and more difficult. Modern combat, therefore, requires more than ever a strong cohesion within a unit in order to give it a *sense of unity*. This cohesion is promoted by good leadership, pride in the accomplishments and reputation of the unit, and by mutual confidence and comradeship among its members. (*Par. 102, FM 100-5*).

Attainment. *a.* Military discipline is attained only by careful and systematic education and training. All types of military training which tend to develop a sense of duty, pride, and responsibility, loyalty, morale, respect, confidence, initiative, and teamwork are beneficial. Such training may be conducted in numerous ways and by many different methods; there is no perfect formula or single rule. No two groups or even two individuals necessarily respond to the same type of training. It is essential to keep in mind that in our country the environment of the soldier may differ materially from that of his previous surroundings. To disregard the civil environment is a serious error. The necessary transition may be a slow, laborious process requiring infinite patience and consideration on the part of the leader. Impossible or unnecessary demands will quickly undermine or even destroy the confidence so necessary in well-disciplined individuals and units. Drills that require accuracy, mental and physical coordination, precision,

and smartness assist in attaining discipline. Short, varied exercises in group physical training are valuable. The fundamentals listed below will be helpful as guides in the attainment of the desired aim.

b. Good leadership, based on personality and character, is essential to the attainment of military discipline. The key to effective leadership is the development of respect and mutual confidence. It is gained when the leader shows in every possible way that he is a member of the unit, and as the ranking member thereof he will leave nothing undone to promote the unit's comfort, welfare, and prestige. Similarly, loyalty and respect are developed through mutual understanding and consideration, through fairness and justice, and by sharing dangers and hardships as well as joys and sorrows.

A commander must live with his troops, and share their dangers and privations as well as their joys and sorrows. By personal observation and experience he will then be able to judge their needs and combat value. A commander who unnecessarily taxes the endurance of his troops will only penalize himself. * * * *

Comradeship among officers and men is to be fostered by every available means. The strong and the capable must encourage and lead the weak and less experienced. On such a foundation, a feeling of true comradeship will become firmly established, and the full combat value of the troops will be made available to the higher commander. (Par. 107, FM 100-5).



Plate 1. Officer's Insignia of Grade, Army and Marine Corps.

A willingness to accept *responsibility* is the foremost trait of leadership. This willingness should not, however, manifest itself in a disregard of orders on the grounds of probably having a better knowledge of the situation than the higher commander. Independence must not be confused with personal caprice.

Officers and men of all grades are expected to exercise a certain independence in the execution of tasks assigned to them and to show initiative in meeting situations as they arise. *Every individual from the highest commander to the lowest private must always remember that inaction and neglect of opportunities will warrant more severe censure than an error of judgment in the choice of the means.* (Par. 108, FM 100-5).

c. A sense of individual pride and responsibility is essential to good discipline. A soldier must be made to realize that all his acts are reflected on the unit to which he belongs. He must aspire to the trust that goes with responsibility. Pride in his organi-

ization is aroused by making him feel that he has some responsibility in developing it. Leaders must use their ingenuity to create opportunities which place responsibility on individuals appropriate to their training and grade.

d. Good morale is conducive to good discipline. It implies contentment and warrants the leader's closest attention. Suitable living conditions, physical welfare, appetizing food, healthful recreation, and relaxation all contribute to morale.

e. Mutual trust is essential for group unity. It stimulates and fosters that unity of purpose and spirit, which under such names as morale, elan, or esprit de corps, is the very heart of a unit's power.



ADMIRAL

VICE
ADMIRALREAR
ADMIRAL

CAPTAIN



COMMANDER

LIEUT.
COMMANDER

LIEUTENANT

LIEUTENANT
JUNIOR GRADE

ENSIGN

Star Denotes Line Officer.

Plate 2. Sleeve Ornamentation, Naval Officers.

Troops are strongly influenced by the example and conduct of their commissioned and noncommissioned leaders. Will power, self-confidence, initiative and disregard of self will enable a leader to master the most difficult situation. A bold and determined leader will carry his troops with him no matter how difficult the enterprise. Mutual confidence between the leader and his men is the surest basis of discipline in an emergency. To gain this confidence, the leader must find the way to the hearts of his men. This he will do by acquiring an understanding of their thoughts and feelings, and by showing a constant concern for their comfort and welfare. (*Par. 104, FM 100-5*).

Maintenance. a. Discipline is maintained in much the same manner as it is attained. There is not and should not be a sharply defined line of demarcation between the two. For example, common sense, good judgment, fairness and justice, high morale, pride, and responsibility contribute as much to maintaining discipline as to attaining it.

b. Self-respect must be maintained at all costs. Corrections are made privately whenever practicable and are never personal or degrading in nature.

c. Commendation for duty well performed is equally as important as admonition, reprimand, or other corrective measures for delinquencies.

d. Young and inexperienced leaders must realize that while firmness is a military requisite, it does not necessitate harshness of manner or of tone.

Relationship Between Superiors and Subordinates. *a.* A leader sets the example for his men to emulate. To accomplish this, he exhibits cheerfulness, loyalty to subordinates as well as to superiors, strict observance of military regulations, customs, and courtesies, neatness and smartness of appearance, and punctuality. Through loyalty to his subordinates, he will gain their confidence and trust and will make them feel that he demands no more of them than he is willing to do himself. The superior will do much toward creating and maintaining the proper relationship with his subordinates by conducting



REAR
ADMIRAL



CAPTAIN



COMMANDER



LIEUT.
COMMANDER



LIEUTENANT



LIEUTENANT
(J. G.)



ENSIGN

Plate 3. Sleeve Ornamentation, Coast Guard Officers.

himself with such dignity and demeanor that his position in the unit is unquestioned. Excessive familiarity between them is avoided. On the other hand, aloofness must be avoided since it will discourage mutual confidence and close relationship between leader and subordinate.

The *combat value* of a unit is determined by the soldierly qualities of its leader and members and its "will to fight." An outward mark of this combat value will be found in the set-up and appearance of the men, in the condition, care, and maintenance of their weapons and equipment, and in the readiness of the unit for action. Superior combat value will offset numerical inferiority. The greater the combat value of the troops, the more powerful will be the blow struck by the commander. Superior leadership

combined with superior combat value of troops, constitutes a reliable basis for success in battle. (*Par. 105, FM 100-5*).

b. Superiors are forbidden to injure those under their authority by tyrannical or capricious conduct or by abusive language. They habitually employ an ordinary conversational manner and tone of voice in addressing subordinates. Firmness and dignity are essential, but an officious, discourteous manner is harmful to the end sought. *Arrogance will breed contempt, sap morale, and destroy discipline.*

COURTESY

General. *a.* Courtesy implies polite and considerate behavior toward others, whether senior or junior, and whether or not members of the military service.

b. In general, juniors habitually give the same precedence to and show the same deference toward their seniors that any courteous person does to his elders. These courtesies should be shown promptly and smartly. Slovenly and half-hearted execution of these acts is in itself discourteous.

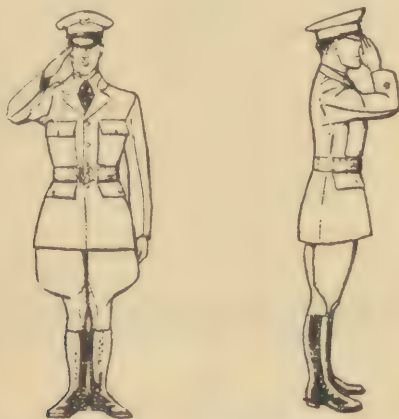


Plate 4. Hand Salute.

The Army Regulations say: "Courtesy among military men is indispensable to discipline," Courtesy is hardly less important in civil life. We cannot enjoy friendships nor have loyal subordinates in any walk of life unless we treat other people with courtesy. Courtesy must be second nature to the soldier, and it should be second nature, that is an almost unconscious habit, to everyone. Courtesy pays the largest returns for the least effort, of anything one can do. Courtesy in civil life is nothing more than the habit of being gentlemanly, thoughtful, kindly and considerate towards others. It has certain forms: such as saying "Good morning," shaking hands, raising the hat to ladies, etc. In the military service the expressions of courtesy are more formal and precise than in civil life. The most important of them is the military salute.

Definitions. *a.* Structures such as drill halls, riding halls, gymnasiums, and other roofed inclosures used for drill or exercise of troops are considered as "out of doors."

b. When the word "indoors" is used, it is construed to mean offices, hallways, mess halls, kitchens, orderly rooms, amusement rooms, bathrooms, libraries, dwellings, or other place of abode.

c. The expression "under arms" will be understood to mean—

- (1) With arms in hand, or
- (2) Having attached to the person a hand arm or the equipment pertaining directly to the arm, such as cartridge belt, pistol holster, or automatic rifle belt. Exception: Officers wearing the officers belt, M1921, without arms attached.

Saluting. *a.* The salute fulfils two functions; to render respect, and to serve as the act of recognition between military personnel. An individual is required to salute when

he meets a person entitled to the salute. Those entitled to the salute are commissioned officers of the Army, Navy, Marine Corps, and Coast Guard. It is also customary to salute officers of friendly foreign countries when they are in uniform.

The formal salute has been the symbol and sign of the military profession since the dawn of history, and, in some form, was probably practiced before that time. The salute is not a mark of subordination, but its omission is a mark of insubordination and lack of courtesy or a bad state of discipline. It is the equivalent of the "Good morning" of civil life. Regulations require that the salute be rendered by both parties. Naturally the junior should salute first.



Figure 1. In uniform, with hat or cap, armed with pistol.



Figure 2. In uniform, with hat or cap, without arms.



Figure 3. In uniform, with hat or cap, armed with rifle.



Figure 4. In uniform with hat or cap removed.



Figure 5. In civilian clothes with headdress.

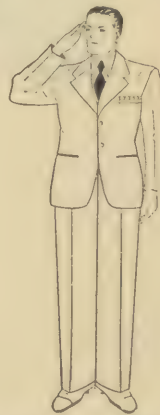


Figure 6. In civilian clothes without headdress.

Plate 5. Salutes.

b. Saluting distance is that distance at which recognition is easy. Usually it does not exceed 30 paces. The salute is rendered before the person to be saluted approaches closer than 6 paces. This permits him time to recognize and return the salute.

c. In executing the salute, the head is turned so as to observe the person saluted.

Salute with the hand. (1) The commands are: 1. *Hand*, 2. *SALUTE*. At the command *Salute*, raise the right hand smartly until the tip of the forefinger touches the lower part of the headdress or forehead above, and slightly to the right of the right eye, thumb and fingers extended and joined, palm to the left, upper arm horizontal, forearm inclined

at 45°, hand and wrist straight; at the same time turn the head and eyes toward the person saluted. (TWO) Drop the arm to its normal position by the side in one motion, at the same time turning the head and eyes to the front.

(2) Execute the first position of the hand salute when six paces from the person saluted, or at the nearest point of approach, if more than six paces. Hold the first position until the person saluted has passed or the salute is returned. Then execute the second movement of the hand salute. (*Par. 20, FM 22-5*).

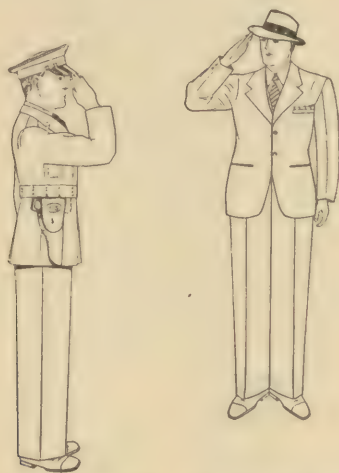


Plate 6. Officer in Civilian Clothes, Soldier in Uniform With Hat or Cap and Without Arms (Or Armed With the Pistol).

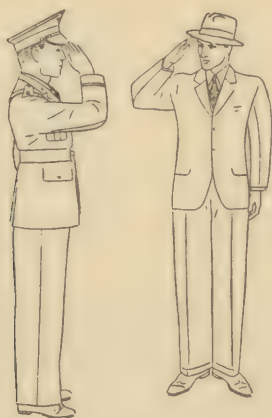


Plate 7. Soldier in Civilian Clothes, Officer in Uniform.

A salute is returned by all officers present entitled to it unless they are in a formation, when the senior only returns the salute except as noted in *p* below.

Subparagraph *p* refers to a case where an officer is talking to a sentinel—if the officer salutes a senior officer, the sentinel will also salute.

The salute must never be returned in a casual or perfunctory manner.

d. The custom and requirement of an exchange of salutes between officers and enlisted men when outside the confines of a military post, camp, or station, has been reinstated. (*Circular No. 50, War Department, February 20, 1942.*)

e. Covered or uncovered, salutes are exchanged in the same manner.

f. The salute is rendered but once if the senior remains in the immediate vicinity and no conversation takes place. If a conversation takes place, the junior again salutes the senior on departing or when the senior leaves.

g. Usually the junior salutes first. However, in making reports, the person rendering the report salutes first, regardless of rank. An example of this is the case of a battalion commander rendering a report to the adjutant at a ceremony.

h. A group of enlisted men within the confines of military posts, camps, or stations and not in formation, on the approach of an officer, is called to attention by the first person noticing him; if in formation, by the one in charge. If out of doors, and not in formation, they all salute; in formation, the salute is rendered by the enlisted man in charge. (Plates 9 and 10).

If indoors, not under arms, they uncover. If outside the limits of military posts, camps, or stations, the salute is authorized but not required unless the group or an individual thereof is addressed by an officer. (See *o* below.)

i. The salute is rendered only at a halt or a walk. If a person is running, he comes down to the walk before saluting. Likewise a mounted person at the trot or gallop comes down to the walk before saluting. (Plate 11)

j. When reporting to an officer in his office, a junior (unless under arms) removes his headdress, knocks, and enters when told to do so. Upon entering, he marches up to within about 2 paces of the officer's desk, halts, salutes, and says, "Sir, reports to, " (using names and grades).

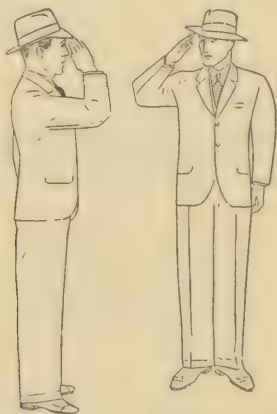


Plate 8. Both Officer and Soldier in Civilian Dress.

For example, "Sir, Private Jones reports to Captain Smith" or "Sir, Private Jones reports to the battery commander." Conversation after the report is made *is carried on in the first person and second person*. When the business is completed, the junior salutes, executes about face, and withdraws. One uncovers (unless under arms) on entering a room where a senior is present.

If the junior reports under arms he does not take off his hat or cap; and he executes the prescribed salute. (Figures 1 and 3, Plate 5.)

k. Drivers of vehicles salute only when the vehicle is halted. The driver of a horse-drawn vehicle will salute only when halted and both hands are not required to control his team. (Plate 14.)

Any other individual in the vehicle renders the hand salute whether the vehicle is halted or in motion.

An officer or a noncommissioned officer in charge of a detail riding in a vehicle renders the hand salute for the entire detail. (Plates 13 and 15.)

The intent of the two sentences above is that, if a vehicle (horse or motor) is occupied by persons not riding in the vehicle as a detail, or as part of the formation, all of the individuals will salute.

If the vehicle is occupied by a detail or part of an organization the individual in charge will, if he is in the body of the vehicle, *rise* and salute; if he is sitting in the front seat with the driver and it is impracticable because of the construction of the vehicle to rise, he will salute seated. The other members of the detail will not salute.

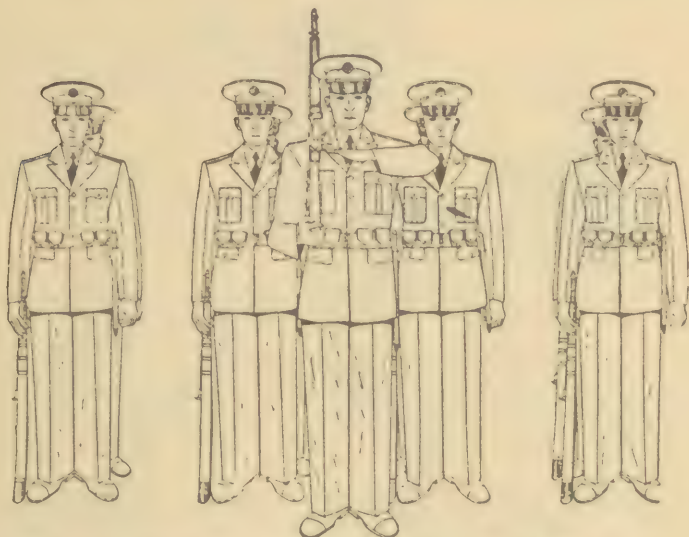


Plate 9. Detachment (Not at Ceremony) Armed With Rifle.

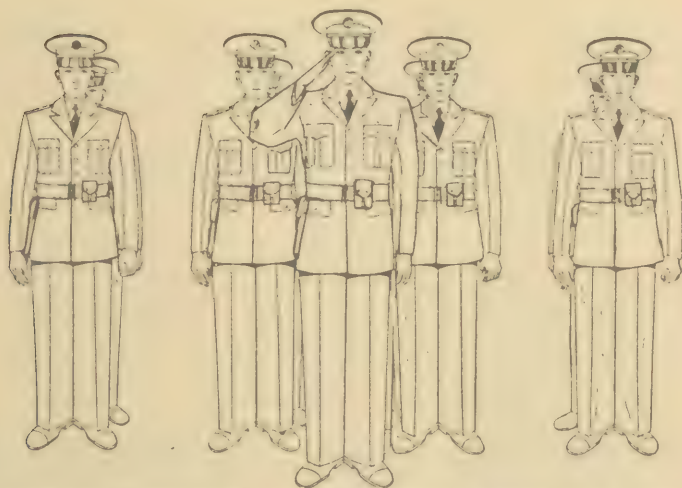


Plate 10. Detachment (Not at Ceremony) Armed With Pistol.

1. Except as noted in paragraph g (below), whenever or wherever the National Anthem* is played or *To the color (standard)* is sounded, at the first note thereof all dismounted officers and enlisted men present but not in formation will face the music, stand at *Attention*, and render the prescribed salute, except that at *Escort of the color (standard)*

* Note.—The "Star Spangled Banner" written September 14, 1814, during the "War of 1812" by Francis Scott Key, poet, lawyer and author, is designated by Act of Congress dated March 3, 1931, as the National Anthem. It should be played as written without flourishes or repetitions. It should not be played as part of a medley.

or at *Retreat* they will face toward the color (standard) or flag. The position of salute will be retained until the last note of the music is sounded.

Those mounted on animals will halt and render the salute mounted. (Plate 11.)

Vehicles in motion will be brought to a halt. Persons riding in a passenger car or on a motorcycle will dismount and salute as directed above.



Plate 11. Mounted (At a Halt or Walk).

Occupants of other types of military vehicles remain seated in the vehicle at attention, the person in charge of the vehicle dismounting and rendering the hand salute.

For example: the person in charge of each vehicle in a convoy (private, noncommissioned officer or officer) will dismount and salute. It is not sufficient for the officer in charge of the entire convoy to salute.

The one exception to this general provision is that tank commanders salute from the turret of the tank or combat car.



Plate 12. Officer Reporting to a Senior Officer, or Soldier to an Officer in an Office.

Individuals leading animals or standing to horse will stand at attention but will not salute.

The same remarks of respect are shown the national anthem of any other country when played upon official occasions.

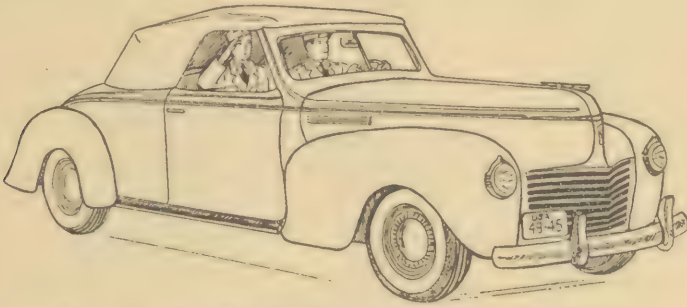


Plate 13. Moving Vehicle, Driver Does Not Salute.

m. When passing or being passed by an uncased national color (standard), honors are rendered in the same manner as when the National Anthem is played.

n. When personal honors are rendered, officers and men present in uniform (not in formation) salute and remain in that position until the completion of the ruffles, flourishes, and march.

In formation the detail, detachment or organization is brought to attention by the commander who then executes the prescribed salute (Plates 9 and 10).

o. Organization or detachment commanders salute officers of higher grades by bringing the organization or detachment to attention before saluting. (Plates 9 and 10.)



Plate 14. Horse-Drawn Vehicle, Halted, and Driver's Hands Necessary to Control Team. Individuals in Vehicle (Not Part of a Detail) All Salute.

p. In garrison, sentinels posted with the rifle salute by presenting arms. (Plate 16.)

Being at order arms. 1. *Present*, 2. *ARMS*. At the command *Arms*, with the right hand carry the rifle in front of the center of the body, barrel to the rear and vertical, grasp it with the left hand at the balance, forearm horizontal and resting against the body. (*TWO*) Grasp the small of the stock with the right hand. (*Par. 41, FM 22-5.*)

During the hours when challenging is prescribed, the first salute is given as soon as the officer has been duly recognized and advanced. A sentinel in conversation with an officer will not interrupt the conversation to salute another officer, but in case the officer salutes a senior, the sentinel will also salute.

q. At a military funeral, all persons in the military service in uniform or in civilian clothes, attending in their individual capacity, will stand at attention uncovered and hold the headdress over the left breast at any time when the casket is being moved by the casket bearers and during services at the grave, including the firing of volleys and the sounding of *Taps*. (Plate 17.) During the prayers, they will also bow their heads. In cold or inclement weather, they will remain covered and execute the hand salute.

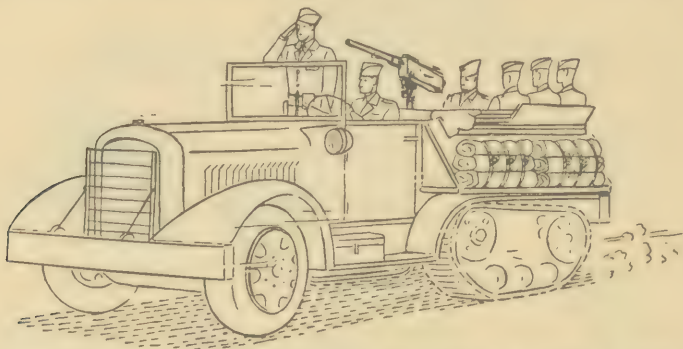


Plate 15. Officer or Noncommissioned Officer in Charge of Detail, Rises and Renders Hand Salute.

at any time when the casket is being moved by the casket bearers and during the firing of volleys and sounding of *Taps*.

To raise pistol. The commands are: 1. *Raise*, 2. *PISTOL*. At the command *Pistol*, unbutton the flap of the holster with the right hand and grasp the stock, back of the hand



Plate 16. Sentinel, Armed With Rifle, Saluting When Anthem is Played or "To the Color (Standard)" is Sounded. (If Armed With Pistol, See Figure 1, Plate 5.)

outward. Draw the pistol from the holster; reverse it, muzzle up, the thumb and last three fingers holding the stock, the forefinger extended outside the trigger guard, the barrel of the pistol to the rear and inclined to the front at an angle of 30° , the hand as high as, and 6 inches in front of, the point of the right shoulder. This is the position of *Raise pistol*.

Summary

The prescribed salute is as follows:

In uniform other than as sentinel or as member of detachment or detail (Plate 4; Figures 1, 2 and 3, Plate 5; and Plate 23).

Posted as sentinel (Figure 1, Plate 5 and Plate 16).

As member of detachment or detail (Plates 9 and 10).

In civilian dress with headdress (Figures 5 and 6, Plate 5, and Plate 17).

In civilian dress with no headdress (Plate 18).

Persons on motorcycles (or in passenger cars) (Plate 19).

Persons in charge of vehicle (Plate 20).



Plate 17. In Civilian Clothes, With Headdress.



Plate 18. In Civilian Clothes, With No Headdress.

Tank or combat car commanders (Plate 21).

Leading or holding horse (Plate 22).

When Not to Salute. Salutes are not rendered by individuals in the following cases:

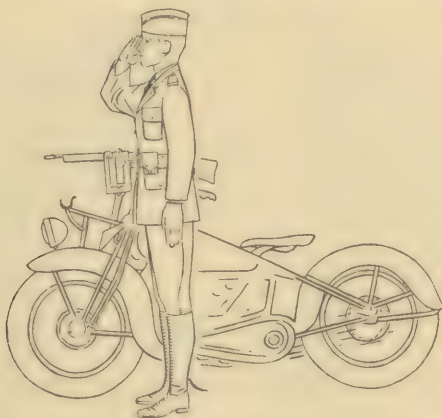


Plate 19. Persons on Motorcycles (Or in Passenger Cars) Dismount and Salute.

a. An enlisted man in ranks and not at attention comes to attention when addressed by an officer. The officer or noncommissioned officer in command renders or receives the salute for the entire organization on the approach of the one entitled thereto.

b. When an officer enters the messroom or mess tent, enlisted men seated at meals remain seated at ease and continue eating unless the officer directs otherwise. Exception: An individual addressed ceases eating and sits at attention until completion of the conversation.

c. Details at work do not salute. The officer or noncommissioned officer in charge, if not actively engaged at the time, salutes or acknowledges salutes for the entire detail.

d. When actually engaged at games such as baseball, tennis, or golf, one does not salute. (Plate 27.)

e. In a squad room or tent, individuals rise, uncover (if unarmed), and stand at attention when an officer enters. If more than one person is present, the first to perceive

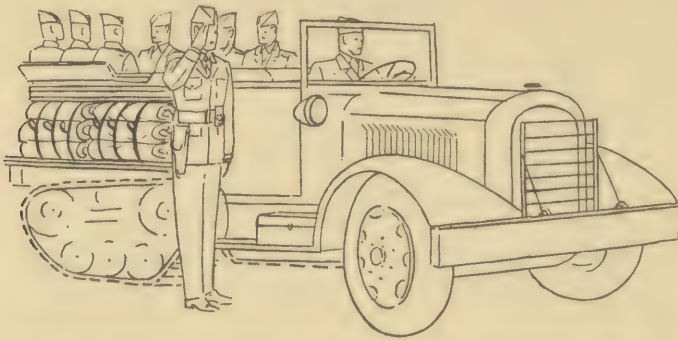


Plate 20. Person in Charge of Vehicle Saluting When National Anthem is Played or "To the Color (Standard)" is Sounded.

the officer calls, "Attention."

f. When standing to horse or leading a horse, one does not salute.

g. In churches, theaters, or other places of public assemblage, or in a public conveyance, salutes are not exchanged.

h. When carrying articles with both hands, or when otherwise so occupied as to make saluting impracticable.

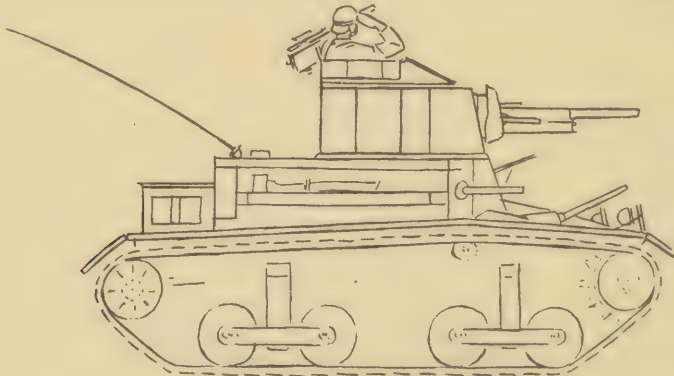


Plate 21. Tank Commander Saluting From the Vehicle.

i. When on the march, in campaign, or under simulated campaign conditions.

j. No salute is rendered to persons by a member of the guard who is engaged in the performance of a specific duty, the proper execution of which would prevent saluting.

k. A mounted or dismounted sentinel armed with a pistol does not salute after challenging. He stands at *Raise pistol* until the challenged party has passed.

l. The driver of a vehicle in motion is not required to salute.

m. Indoors, salutes are not exchanged except when reporting to a senior.

Uncovering. Officers and enlisted men under arms as a general rule do not uncover except when—

a. Seated as a member of or in attendance on a court or board. (Sentinels over prisoners do not uncover.)

b. Entering places of divine worship.

- c.* Indoors when not on duty and it is desired to remain informally.
d. In attendance at an official reception.

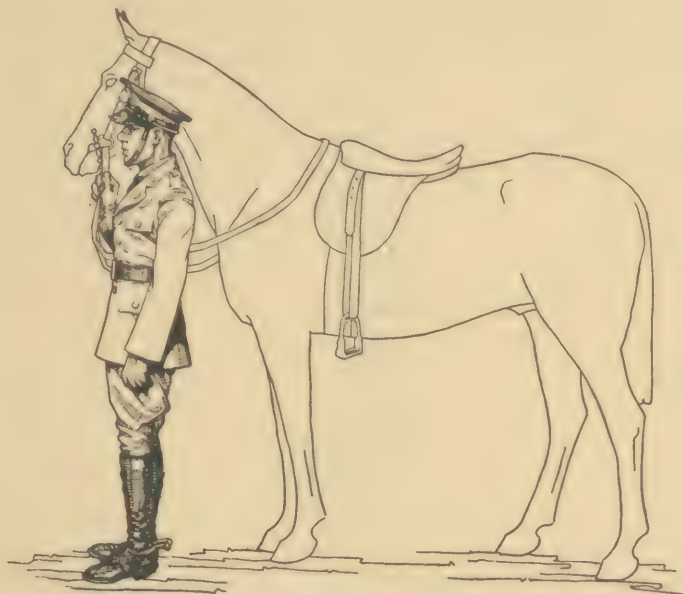


Plate 22. Stand to Horse.

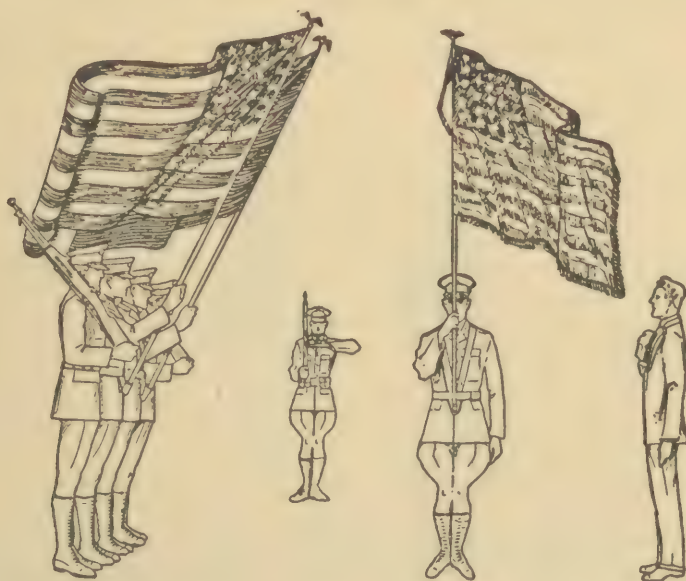


Plate 23. A Soldier (Armed) Saluting the Colors (Standards).

Plate 24. A Civilian Saluting the Color (Standard).

Personal Courtesies. *a.* Except in the field under campaign or simulated campaign conditions, a mounted junior always dismounts before speaking to or replying to a dismounted senior. When accompanying a senior, a junior walks or rides on his left.
b. Military persons enter automobiles and small boats in inverse order of rank and leave in order of rank; that is, the senior enters an automobile or small boat last and

leaves first. Juniors, although entering the automobile first, take their appropriate seat in the car. The senior is always on the right.

Titles. *a.* The following titles are used in intercourse with officers of the Army:

(1) Lieutenants are addressed officially as "Lieutenant." The adjectives "first" and "second" are not used except in official written communications.

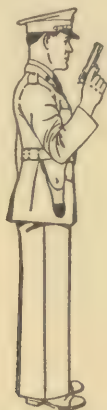


Plate 25. Raise Pistol.

(2) Other officers are referred to by their titles. In conversation and in non official correspondence, brigadier generals, major generals, lieutenant generals, and generals are referred to and addressed as "General." Lieutenant colonels, under the same conditions, are referred to and addressed as "Colonel."

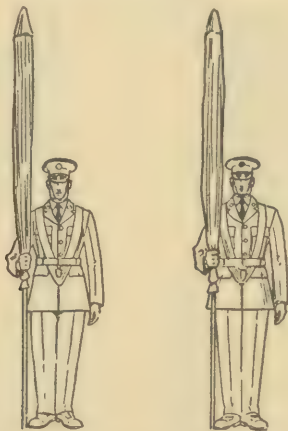


Plate 26. Colors (Standards) Cased—Never Saluted.

(3) Senior officers frequently address juniors as "Smith" or "Jones," but this does not give the junior the privilege of addressing the senior in any other way than by his proper title.

(4) Chaplains are addressed as "Chaplain" regardless of their grade. A Catholic chaplain may be addressed as "Father."

b. Cadets of the United States Military Academy are addressed as "Cadet" officially and in written communications.

Air Corps cadets are addressed as "Cadet."

c. Warrant officers are addressed as "Mister."

d. Members of the Army Nurse Corps are addressed as "Nurse."

e. Noncommissioned officers are addressed by their titles. Officers address them as

"Sergeant," "Corporal," etc. Officers address privates as "Smith" or "Jones." Master sergeants, technical sergeants, staff sergeants, etc., are all addressed simply as "Sergeant." In official communications, the full title of an enlisted man is used.

f. In the Navy, officers in both line and staff are addressed officially by their titles. Any officer in command of a ship, whatever its size or class, while exercising such command is addressed as "Captain."

Visits to War Vessels. *a.* A vessel of war will be approached and boarded by commissioned officers and visitors in their company by the starboard side and gangway; all other persons will use the port gangway. The commanding officer of the ship may change this rule, if expedient.

b. In entering a boat, the junior goes first and other officers follow in order of rank; in leaving a boat, the senior goes first.



Plate 27. In Athletic Costume—Stand at "Attention."

c. An officer paying a boarding visit to a vessel of war or transport is met at the gangway by the officer of the deck.

d. The salutes to be exchanged upon boarding and leaving a vessel of war are prescribed below and conform to regulations of the United States Navy. All members of the Army visiting a vessel of war will conform.

(1) All officers and men, whenever reaching the quarterdeck either from a boat, from a gangway, from the shore, or from another part of the ship, will salute the national ensign. In making this salute, which will be entirely distinct from the salute to the officer of the deck, the person making it will stop at the top of the gangway or upon arriving upon the quarter-deck, face the ensign, and render the salute, after which the officer of the deck will be saluted. In leaving the quarter-deck, the same salute will be rendered in inverse order. The officer of the deck will return both salutes in each case, and shall require that they be properly made.

(2) The commanding officer will clearly define the limits of the quarter-deck; it will embrace so much of the main or other appropriate deck as may be necessary for the proper conduct of official and ceremonial functions. When the quarter-deck so designated is forward and at a considerable distance from the ensign, the salute to the ensign prescribed in (1) above will not be rendered by officers and men except when leaving or coming aboard the ship.

(3) The salute to the national ensign to be made by officers and enlisted men with no arms in hand will be the hand salute, the headdress not to be removed.

e. All officers in the party salute the ensign, but only the senior renders or returns the salutes, other than that to the ensign, given at the gangway of a naval vessel. (See AR 605-125).



CHAPTER XIII

CUSTOMS OF THE SERVICE

Titles. a. Army of the United States.

A certain amount of familiarity is necessary between senior and juniors in social intercourse, but young officers should be exceedingly careful to show proper respect to their seniors at all times.

Officers of the same grade, except when there is considerable difference in age and dates of commission, generally address one another by their last names. (Par. 2, Appendix, FM 21-50).

b. Navy captains. In speaking to or introducing captains of the navy, it is customary to add after the name, "of the Navy," in order to indicate that the officer belongs to the Navy and not to the Army or the Marine Corps. The reason for this practice is that the grade of captain in the Navy corresponds to the grade of colonel in the Army. (Par. 2, Appendix, FM 21-50).

c. Relative rank between officers of the Army and the Navy.

General with admiral.

Lieutenant general with vice admiral.

Major general with rear admiral.

Brigadier general (no corresponding grade).

Colonel with captain.

Lieutenant colonel with commander.

Major with lieutenant commander

Captain with lieutenant.

First lieutenant with lieutenant (junior grade).

Second lieutenant with ensign. (Par. 2, Appendix, FM 21-50).

Calls of Courtesy. a. General. The interchange of visits of courtesy between officers is of great importance, and the well-established customs of the Army in this respect will be scrupulously observed. Failure to pay the civilities customary in official and polite society is to the prejudice of the best interests of the Service. Calls are made at a time convenient to the officer upon whom the call is to be made. As calling customs vary somewhat at different posts, camps, and stations, it is wise to ascertain local practices from the adjutant. It is customary for officers to call on a new arrival as soon as he is situated so that callers can be received comfortably and without embarrassment. If the newcomer is married and his family is present, ladies call with their husbands.

b. Formal. Formal calls are those made in the discharge of an obligation. A formal call ordinarily should not exceed 15 minutes' duration. An officer should be exceedingly punctilious about formal calls. Calls should ordinarily be returned within 10 days.

An officer arriving at a post whether for duty or for a visit longer than 24 hours, will call on the post commander at his office and at his quarters unless directed otherwise by the adjutant. He ascertains from the adjutant what other calls are customary, when they should be made, and complies therewith. If unable to wear uniform, an explanation is made for appearing in civilian clothes. The official visits to the post and intermediate commanders should be repeated at their residences during proper calling hours within 24 hours after arrival. If the commander is married and his wife is present on the post, it is customary for the officer making the visit at the residence to be accompanied by his wife. These calls are formal and ordinarily should last no longer than 15 minutes. It is normally not necessary for the new arrival to make other calls until the officers of the battalion, regiment, or garrison have called on him.

An officer who is assigned or attached to a place and who is about to depart permanently therefrom makes a parting visit to his immediate commanding officer and to

the commander of the post, camp, or station. (See AR 605-125.)

c. Calling hours. Inquiry should be made of the adjutant as to the normal calling hours in effect at the post, camp, or station concerned. Evening calls are usually made between 7:30 and 9:00 P.M.

d. Dress when calling. Proper uniform or civilian dress is worn. (See AR 600-35 and 600-40.)

e. Calling cards. Leave cards when making formal calls. A man should leave one card for each adult member of the household, including guests. Ladies leave one card for each adult lady of the household. More than three of any one card should never be left, however, regardless of the number of people being called upon. (Par. 3, Appendix, FM 21-50).

Messes. In garrison, the officers' mess is important as a meeting place of bachelor officers, and customs of the service have laid down strict rules regarding it. These rules vary at different posts and in different messes. However, in general, an officer never attends a meal unless he is properly dressed. The senior officer *at the table* is the president of the mess and receives due consideration as such. Similarly, this may apply to the senior officer at any table in the mess.

Usually the evening weekday meal and the Sunday midday meal are formal. At these meals, it is customary in some messes to await the arrival of the senior officer before being seated. Normally, no one leaves the table until the senior officer present has finished his meal or otherwise excuses them. Exceptionally, when departure is necessary, the officer requests to be excused. If a member of the mess arrives late, he expresses his regrets to the president of the mess before taking seat.

Social Functions. It is customary for all officers to attend garrison social functions and to make them pleasant affairs. Procedure is similar to that at like civilian functions.

Officers of all grades make a point of presenting themselves to seniors, especially to their commanding officers and their families.

Visitors must not be neglected. They must be considered as guests of the assembled group. All officers must be solicitous for their entertainment and well-being.

Official subjects are avoided at these functions.

General Rules. Distinguished visitors, either military or civilian, are generally honored by appropriate receptions, either by the commander or by the officers of the garrison. Although such gatherings are primarily social, nevertheless they have an official aspect. Attendance is regarded as obligatory and absence therefrom should occur only for those reasons which necessitate absence from a military formation.

When the commanding officer says, "I desire," or "I wish," rather than, "I direct you to do so-and-so," this wish or desire has all the authority of an order.

Custom demands that officers be meticulous about their personal appearance and especially so when in uniform. Their behavior at all times must reflect only credit on the military service. (Par. 6, Appendix, FM 21-50).

Avoid the impolite practice of approaching a senior officer, whom you know or remember well, expecting him to remember your name and where he has known you before. When you speak to an officer, introduce yourself by name and refresh his memory regarding where he has known you. The same rule applies when approaching members of a receiving line.

An officer should wear proper civilian clothing on those occasions which permit or require it to be worn.

Explanations are made only when called for.

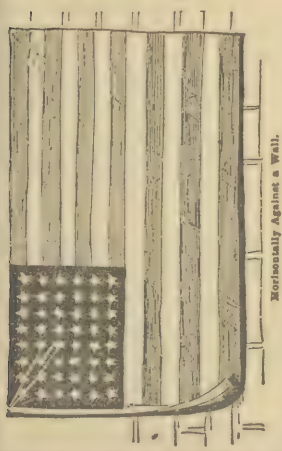
Courtesy should be habitual. Courtesy to subordinates is equally as important as courtesy to superiors.

Conversation between military personnel is conducted in the first and second person except when making an official report.

Punctuality should be a habit. (Par. 6, Appendix, FM 21-50).

Miscellaneous. Because of the unfavorable comment which may arise as a result thereof, officers of the Army are prohibited from using, or permitting to be used, their military title in connection with commercial enterprises of any kind.

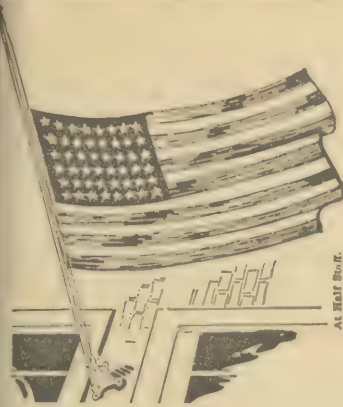
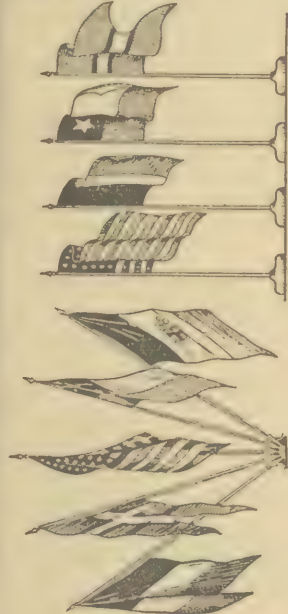
Personnel of the Army are prohibited from soliciting contributions for gifts or presents to those in a superior official position. Likewise no persons will accept "any gift or present offered or presented to them as a contribution from persons in Govern-



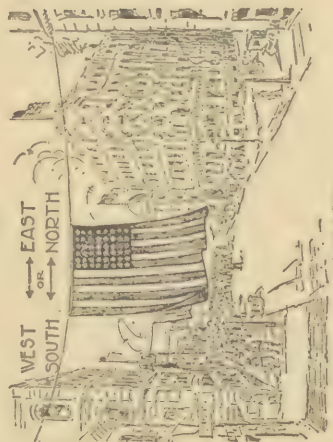
Horizontally Against a Wall.



Against a Wall with Another Flag.

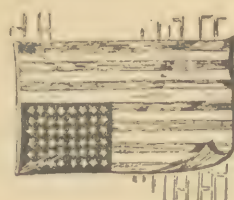


At Half Mast.

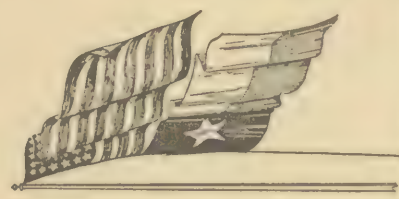


WEST
← EAST
ON
→ SOUTH
NORTH

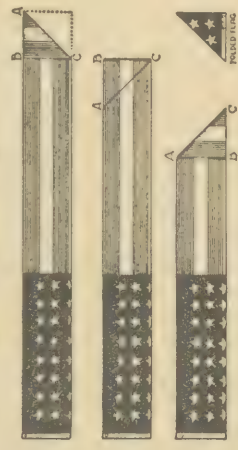
Across a Street.



Vertically Against a Wall.



With Another Flag on a Field.



How to Fold the Flag.



On a Caisson.



From a Horizontal Staff.

Plate 1. Proper Use and Display of Flag.

ment employ receiving a less salary than themselves." (See AR 600-10.) (Par. 7, Appendix, FM 21-50).

Display of Flag. (See "Standards and Guidons.") While there is no law or regulation on the subject, the following procedure should be observed in displaying the national flag:

a. When not flown from a staff, the flag should always be suspended flat, whether indoors or out.

b. When used on a rostrum, the flag should be displayed above and behind the speaker's stand.

c. The flag should never be used as a drape for a platform, desk, chair, or bench. For such purpose, and for general decoration, bunting of the national colors should be used. For correct use of the flag under various circumstances, see Plate 1.

The Flag of the United States. a. Our flag is the visible symbol of our nation, and as such is held sacred by all loyal citizens.

b. In the service the flag is designated also as "color," "standard" or "ensign" according to its use. A color is a flag carried by dismounted troops; a standard is carried by mounted or motorized troops; an ensign is a flag flown on a ship or boat. The flag has 7 red and 6 white stripes, representing the original 13 states, and a union of white stars on a blue field, one star for each state now in the Union. Colors and standards are trimmed with a knotted fringe, with a cord and tassels on the staff or pike.

The following customs for display of the flag are in further explanation. (Plate 1) When on a staff or pole the inner upper corner of the union is at the peak of the staff, with the stripes perpendicular to the staff. The edge attached to the staff is called the heraldic dexter or right edge.

(2) When carried with another flag or flags the national emblem is always on the right. (Plate 23, Chapter XIII.)

(3) When a number of flags are grouped and displayed from staffs the national emblem should be in the center or at the highest point of the group.

(4) When hung either horizontally or vertically on a wall the union should be up and to the flag's right (the observer's left.)

(5) When displayed across a street the flag is hung vertically, with its right edge secured to a cable stretched at right angles across the street. The union should be up and to the north in an east or west street or to the east in a north or south street, and the flag should be at such a height that it is well clear of all traffic in the street.

(6) When displayed on the same staff or pole with another flag or flags the national emblem is always placed at the peak (top) of the staff. In time of peace the flag of one nation may not be displayed above that of another. If two national emblems are displayed together they should be on separate staffs and at the same level.

(7) On occasions of mourning the flag may be flown at half-mast or half-staff. It is first raised to the peak and then lowered to half-staff position. Upon being taken down it is first raised to the peak and then lowered to the ground.

(8) The national emblem may be used to cover the casket at a military funeral. It is placed with the union at the head and over the left shoulder of the deceased. It is not lowered into the grave.

(9) Colors and standards, when not on display or during inclement weather, remain on their staffs and are covered with a waterproof case. When stowed away for the night, or at any time when not on display, a flag is folded as described in AR 260-10.

(10) The national emblem is never dipped in salute. Regimental colors and standards are dipped in salute by lowering the staff to an inclination of about 45 degrees.

(11) The flag is always displayed flat. It should not be looped or festooned. It should not be used to drape or cover anything (except a casket), nor should anything be placed on or above it. For such decoration red, white and blue bunting may be used with the blue uppermost.

(12) The flag is never allowed to touch the ground.

(13) No lettering is ever placed upon the flag. It should not be used for advertising nor decorative purposes, such as part of a costume, at the head of a letter, embroidered upon a cushion, etc.

CHAPTER XIV

BALLISTICS AND PROJECTILES

Introduction. The purpose of this chapter is to present a digest of many of the essentials of ballistics, projectiles, and the effects of fires in producing casualties. The medical officer needs an understanding of the nature of the machines which cause injuries in order that he may provide for their proper treatment. He requires an understanding of the characteristics of the fires delivered by the many weapons in use in order that he may protect his own personnel and the wounded from unnecessary exposure which might result in additional casualties.

Ballistics. Ballistics is the science which treats of the flight of projectiles discharged from firearms. Interior ballistics deals with the flight of the projectile within the barrel of the weapon from the starting point until it leaves the muzzle. A projectile reaches its maximum initial velocity (muzzle velocity) just beyond the muzzle. Exterior ballistics deals with the flight of the projectile from the muzzle of the gun to its striking point.

As soon as the powder charge of the propellant is ignited, gas is given off and the



Plate 1. Trajectory for 1000 Yards, Model 1906 Ammunition.

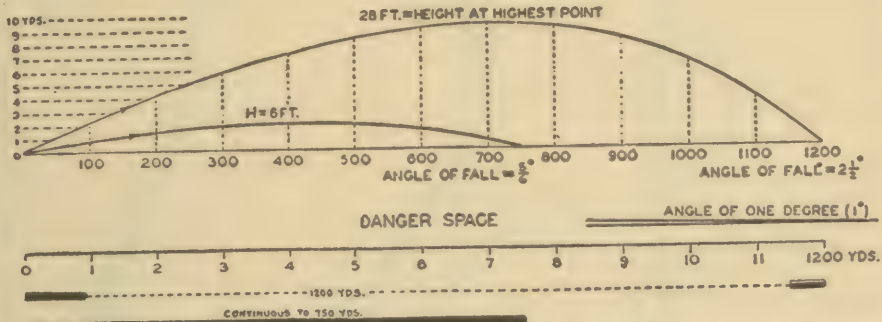


FIGURE 1. —Trajectory diagram for the cartridge, ball, caliber .30, M1906 (vertical scale is 20 times the horizontal scale).

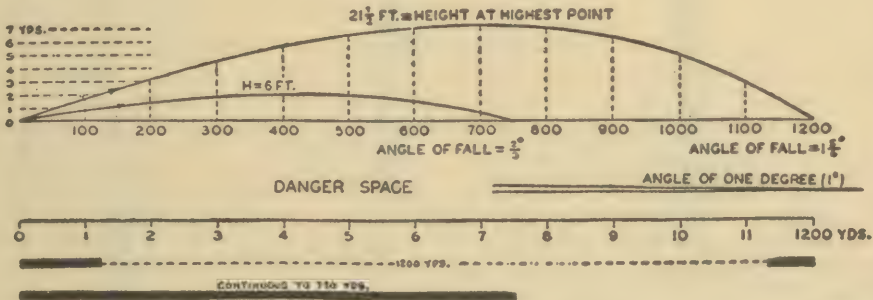


FIGURE 2. —Trajectory diagram for the cartridge, ball, caliber .30, M1 (vertical scale is 20 times horizontal scale).

Plate 2. Trajectory Diagrams.

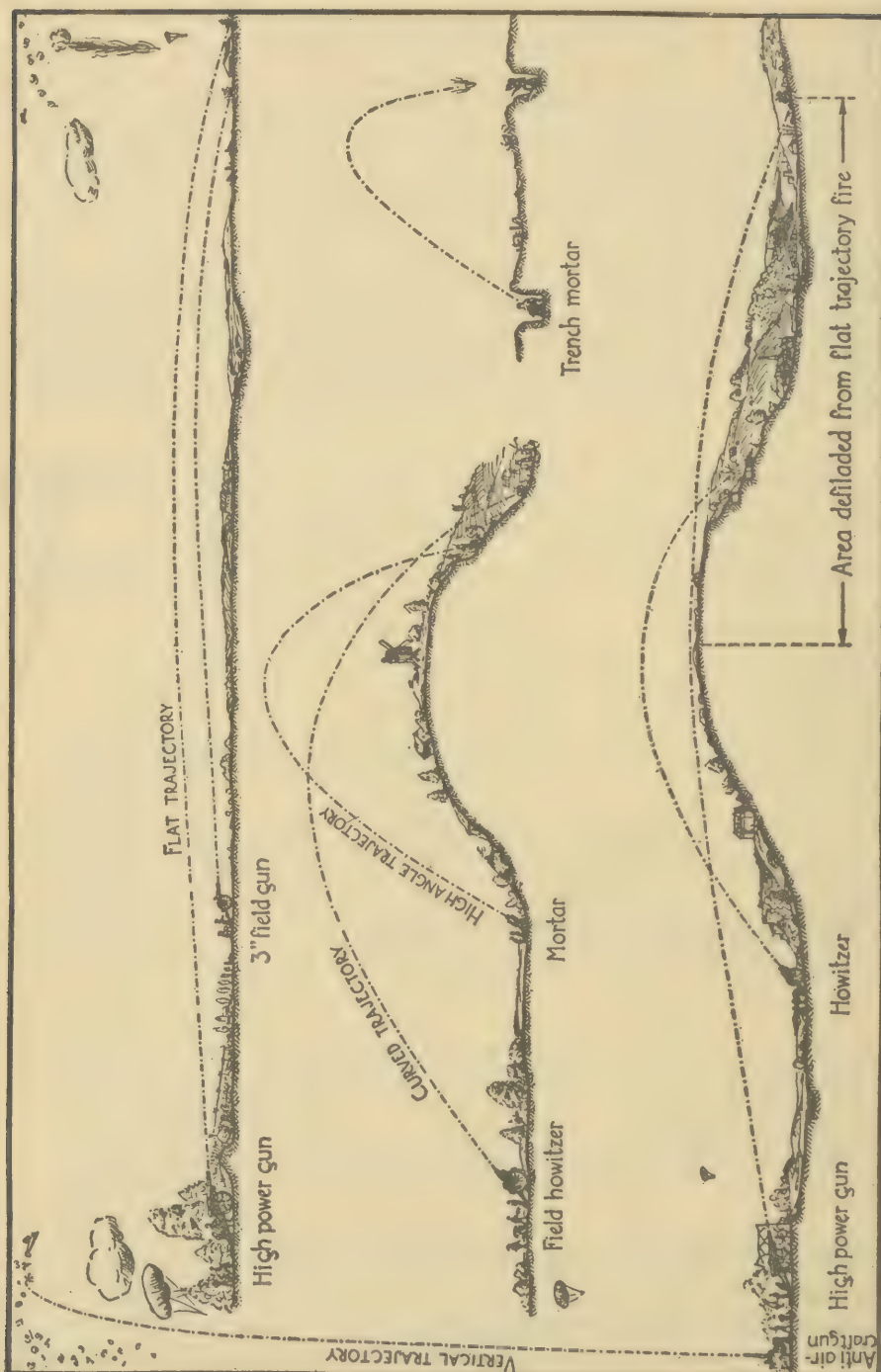


Plate 3. Trajectories of Guns, Howitzers, and Mortars.

chamber pressure increases enormously. The force of this gas drives the projectile through the barrel. The interior of the barrel contains "rifling" (spiral lands and grooves), the interior diameter being somewhat less than the maximum diameter of the projectile. When the pressure in the chamber is high enough to overcome the shearing resistance of the copper rotating band, in the case of artillery ammunition, or of the relatively soft metal of a rifle bullet, the projectile moves forward, sealing the bore to retain the force of the expanding gases and engraving the rifling upon the rotating band or the projectile itself. Thus the expanding gases impart the forward motion, and the rifling imparts a spin to the projectile; these factors prevent tumbling and hold the projectile true in flight.

At the time the projectile leaves the muzzle, that is to say, when the projectile enters the field of exterior ballistics, it is acted upon at once by the force of gravity and the effects of air resistance. The effect of gravity is to curve the projectile downward, to retard its flight during the upward movement, and to accelerate it during the descent. The effect of air resistance is material and complicated. For the immediate purpose of this discussion, a wind from the side will deflect the bullet in its trajectory; further, the reaction of the air sets up a drag incident to the creation of a vacuum at the base of the projectile while in flight. Improvements in the design of projectiles, as in the M1 or "boat-tail" rifle ammunition, reduce the extent of this drag which causes material changes in the characteristics of the fire with respect to the range, which is increased, and the maximum ordinate while in flight, which is reduced.

Trajectory. The trajectory is the curved path followed by the bullet in its flight through the air. Because of its great speed the trajectory of rifle or machine-gun fire at short ranges is nearly flat, the bullet flying in almost a straight line from the muzzle of the gun to the target. The height of the trajectory increases and rises above the line of aim as the range increases. Plate 1 shows the trajectory of a rifle bullet for a range of 1000 yards; it will be noted that the projectile rises to a height of only 14 feet above the line of aim. Trajectory diagrams for the rifle and other weapons are further illustrated in Plates 2 and 3.

The vertical height of the trajectory above the horizontal plane, at any point, is known as the *ordinate*, and the greatest height at the summit of the trajectory is called the *maximum ordinate*.

Danger Space. Since the trajectory of a rifle bullet for a range of 750 yards does not rise above the height of a man standing (68 inches), it follows that on level or uniformly sloping ground all the space between gun and target is endangered. Thus, the *danger space* for ranges up to 750 yards is continuous. (See Figure 1, Plate 4.) For ranges of 800 yards or more the bullet does rise above the height of a man. For such ranges the danger space consists of two parts; first, the space from the rifle to the point at which the bullet rises above the height of a man; and second, the space from the point where it again falls within the height of a man to the target. (See Figure 2, Plate 4) This characteristic of the trajectory enables machine guns to deliver supporting fires (overhead fire) in support of troops in the line of fire in advance of the gun positions, within the limits established by safety angles which are prescribed in fire control tables.

Dispersion. Experience has shown that bullets fired from a firearm do not follow exactly the same path. (See Plate 5) Due to minute differences in ammunition, aiming, holding, and atmospheric conditions the bullets scatter slightly. This effect is called *dispersion*, and the trajectories of those bullets form an imaginary cone-shaped figure, with its apex at the muzzle, called the *cone of dispersion*. This characteristic is applied in firing against hostile aviation since the dispersion compensates for minor errors in aim.

Shot Groups. When the cone of dispersion strikes a vertical target it makes a pattern upon it called a *vertical shot group*. (See Plate 6) The pattern made on a horizontal target or surface is called a *horizontal shot group*. Hits are not distributed evenly over the entire pattern but are much closer together near the center. Vertical shot groups are oval shaped while horizontal shot groups take the form of a long, narrow ellipse.

Beaten Zone. The ground struck by the bullets forming a cone of dispersion is called the *beaten zone*. Where the ground is level, the beaten zone is also a horizontal shot group. The slope of the ground has great effect on the size and shape of the beaten zone. (See Plates 4 and 7.)

FIG.1 CONTINUOUS DANGER SPACE

At short range the height of the trajectory never exceeds that of a man

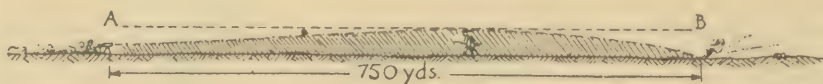


FIG.2 SHORT DANGER SPACE AND LONG SAFETY SPACE IN LONG RANGE FIRE

Between A and B the bullet is always higher than a man's head

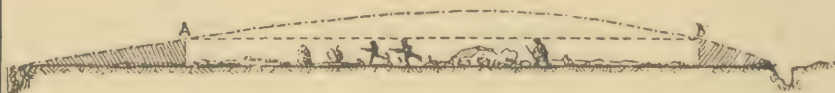


FIG.3 DANGER SPACES OF TRAJECTORY AND RICOCHET

At A occurs the "first catch" by lowest part of cone of fire. At B occurs the "first graze". At short and medium ranges, where trajectory is flat, there is an indefinite danger space beyond C, due to ricochet depending on the direction and remaining velocity of the ricochet bullets



SHEAFS OF FIRE, BEATEN ZONES AND DANGER SPACES AT SHORT AND AT LONG RANGES

FIG.4 SHORT RANGE



FIG.5 LONG RANGE

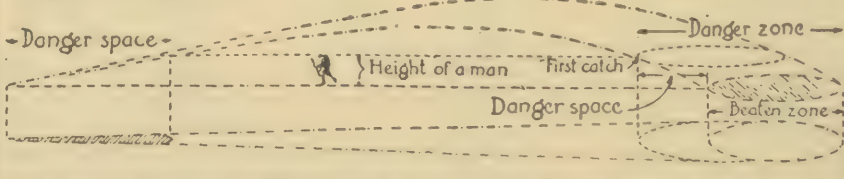


Plate 4. Danger Space, Beaten Zone, and Danger Zone of Rifle Fire.

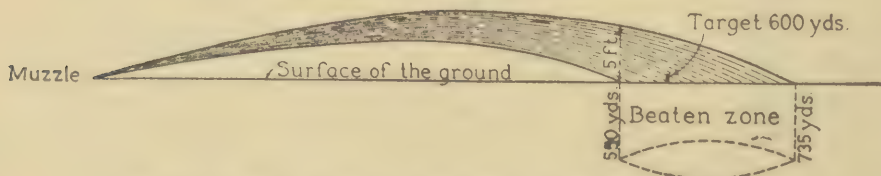


Plate 5. Cone of Fire or Dispersion and Beaten Zone.

Danger Zone. An enemy is in danger when he is in the beaten zone or in the corresponding danger space. Where bullets strike the ground at an acute angle they *ricochet* (glance up in the air); this results in additional danger space. The *danger zone* is comprised of all the danger spaces mentioned above. (See Plate 4)

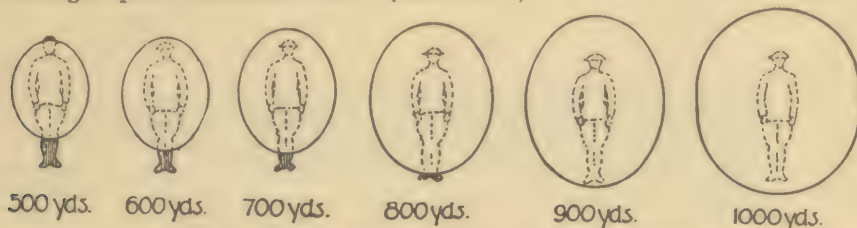


Plate 6. Vertical Shot Groups at Various Ranges.

Defilade. In the presence of an enemy, troops seek areas for stationary installations and as avenues of advance or retirement which are protected from enemy fire. These areas are provided by ground forms such as intervening hill masses, valleys, minor irregularities in the surface of the ground, and trenches. If they cannot be reached by the flat-trajectory

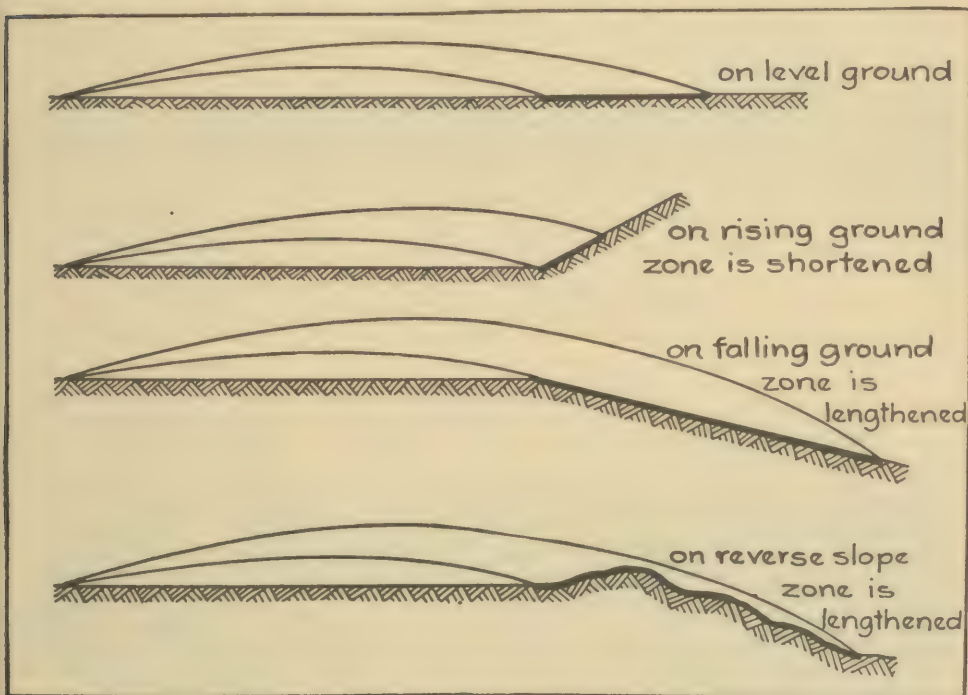


Plate 7. Effect of Ground Slopes on Beaten Zone.

weapons of the enemy, such as rifles, machine guns and light artillery, they are said to be in *defilade*. It is impossible to secure defilade from high-trajectory weapons such as the 81-mm mortar because its projectile may fall at right angles to the surface of the ground. Overhead protection must be obtained to escape the effect of such fires. Mere concealment on a reverse slope may not provide defilade since the curve of the trajectory may permit the fire to sweep and search such slopes. (See Plates 3 and 7.)

Projectiles. Casualty producing projectiles include bullets fired from small arms (rifles and caliber .30 machine guns), infantry mortars, antitank guns, chemical mortars, and artillery projectiles such as shrapnel, high explosive shell, and chemical shell. Armor-piercing projectiles are designed to penetrate protective armor, such as tank armor, in order to cause casualties within the vehicle. (See Plates 8, 9, and 10.)

High Explosive Shell. High explosive shell is a cylinder of iron and steel with a conical head. The projectile has thick walls, and the hollow core is filled with an explosive charge which is detonated by means of a time fuse or percussion cap that explodes on contact.



Plate 8. The Rifle and Machine Gun Cartridge, Caliber .30.

Legend: 1. Bullet; 2. Propelling charge; 3. Cartridge case.

The casing is ruptured and fragmented, and each individual fragment becomes in itself a projectile capable of inflicting serious lacerated wounds, owing to the jagged shape of the individual pieces. These fragments vary in weight from a few grains to as much as 150 pounds. Light artillery shells weigh approximately 15 pounds; heavy artillery shells weigh as much as a ton.

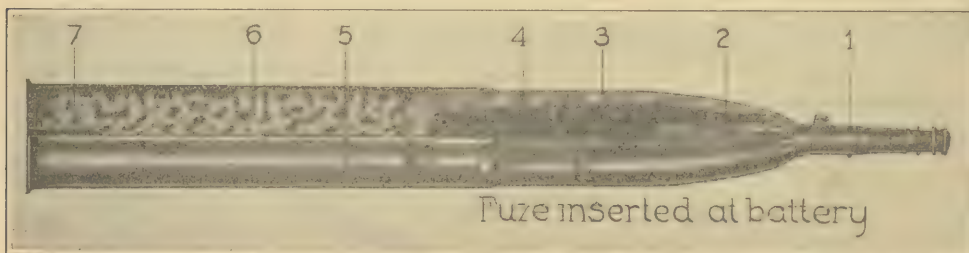


Plate 9. An Assembled Round of 75-mm High Explosive Ammunition.

Legend: 1. Fuze, point detonating Mk. III; 2. Adapter and Booster, Mk. III-B; 3. High Explosive Shell, Mk. IV; 4. Bursting charge TNT; 5. Cartridge case; 6. Propelling charge; 7. 49-grain primer, Mk. I.

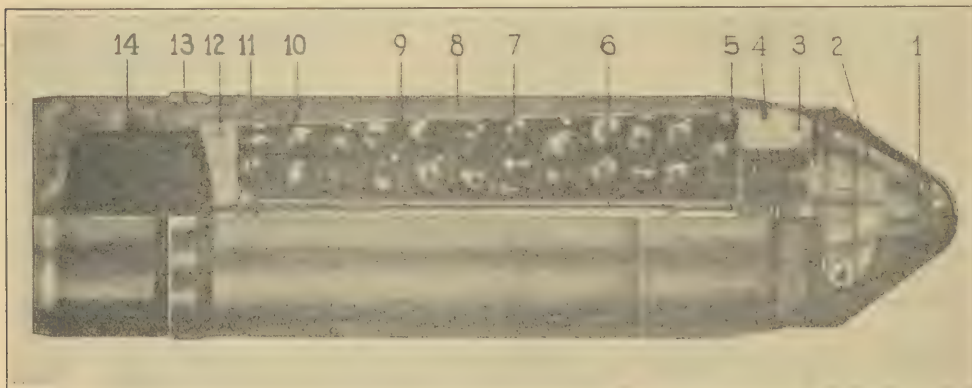


Plate 10. Projectile Only, 75-mm Shrapnel.

Legend: 1. Waterproof cover; 2. 21-second combination fuze; 3. Head; 4. Inner tube; 5. Bourrelet; 6. Central tube; 7. Balls; 8. Case; 9. Matrix (resin); 10. Fiber paper cup; 11. Cloth disk; 12. Diaphragm; 13. Rotating band; 14. Base charge (loose black powder).

Shrapnel. Shrapnel consists of a cylinder of steel which contains a varying number of round lead bullets approximately .5 inch in diameter. The bursting charge in the base is exploded by means of a time fuse in the head. The usual employment of this fire is to obtain an air burst above the ground and on the near side of the target. At the time of bursting, the lead balls are driven out in the form of a cone. In effect, shrapnel is a flying

shotgun. The case itself does not undergo much fragmentation, but each individual bullet, as well as the time fuse and the casing, becomes a separate projectile. Shrapnel is especially useful for employment against exposed personnel.

Chemical Shell. Chemical shells obtain their name from the nature of the filler. The filler may be a lethal gas or a smoke compound. When the shell bursts, the chemical filler produces a gas or smoke cloud, in contradistinction to the effect of high explosive shell which depends upon the blast of explosion and the fragmentation of the shell body. Smoke shells are used to deny observation to an enemy; the smoke itself is not a casualty producing agent.

Bombs. Bombs dropped from airplanes in flight include fragmentation, demolition, and chemical bombs. High explosive is the most common load as it is effective in demolitions as well as in producing casualties. Airplanes are able to carry bombs which weigh as much as two tons.

Bursting Radius. The radius measured from the point of impact or detonation of a bursting projectile and including the zone within which casualties are almost certain to be produced is called the *bursting radius*. It varies in size in accordance with the nature of the shell, the kind and quantity of the charge, and the slope of the ground.

Fire Superiority. Fire superiority is the condition obtained by delivering such an effective fire against an enemy that his own fires are greatly reduced in accuracy and volume. In its utmost application it causes the enemy to forget all else save self-preservation. It must be obtained before troops can advance upon an enemy position except at the cost of heavy casualties. It is a moral phenomenon and purely relative. It is obtained as a result of accuracy, proper distribution over the entire area occupied by an enemy capable of holding up an advance, and great volume. Against inferior troops the condition may be obtained with relative ease. Once established it must be maintained for without it an attack will be stopped or the defense will be overwhelmed.

Effect of Rifle Fire. The bulk of rifle fire is delivered at ranges within 600 yards, although selected men may open fire at longer ranges. In the defense where good observation and long fields of fire are available, fire may be opened at ranges as great as 1000 yards. Machine guns fire at much greater ranges because of their volume of fire and the fixed mount (tripod), as well as their capacity for delivery of fire by indirect laying at invisible targets. At a range of 2500 yards a rifle bullet has enough force to disable a man.

Rifle fire has both physical and moral effects. Properly placed, fire produces casualties and may cause the enemy to remain under cover. At ordinary ranges the sound of a bullet passing within a few yards is a sharp, frightening crack. Bullets which fall a little short kick up a shower of dirt and stones and ricochet with a loud, disconcerting whine. Thus, while hits are desirable, shots that come close to the target have considerable effect. The enemy is afraid to stick his head up long enough to take careful aim. He may become excited, unable to think clearly, or to act with coolness. These factors are worthy of consideration during the training process of all troops whose missions take them within the combat zone since this knowledge will serve to increase confidence and overcome many human fears.

Effect of Artillery Fire. Artillery projectiles cause the bulk of battle casualties. It is accurate, it may be delivered with surprise effect at long range, and may be massed in great volume to strike within a limited area. It may be used to destroy material objectives. Because of the high trajectory of mortars and howitzers they can place their projectiles in areas which are in defilade from flat-trajectory weapons.

Against troops in dense formation the casualty effect of even a single shell is material because of the extent of its effective bursting radius. The force of detonation of high explosive shell may cause casualties without hits by shell fragment. The moral effect of artillery fire is especially serious.

A.E.F. Battle Casualties by Arm and Service. The statistics recorded below indicate by arm and service the rate per thousand and the absolute numbers of killed and wounded in the American Expeditionary Force.¹

¹ Medical Department of the United States in the World War, Vol. XV, Statistics, Part 2, Medical and Casualty Statistics.

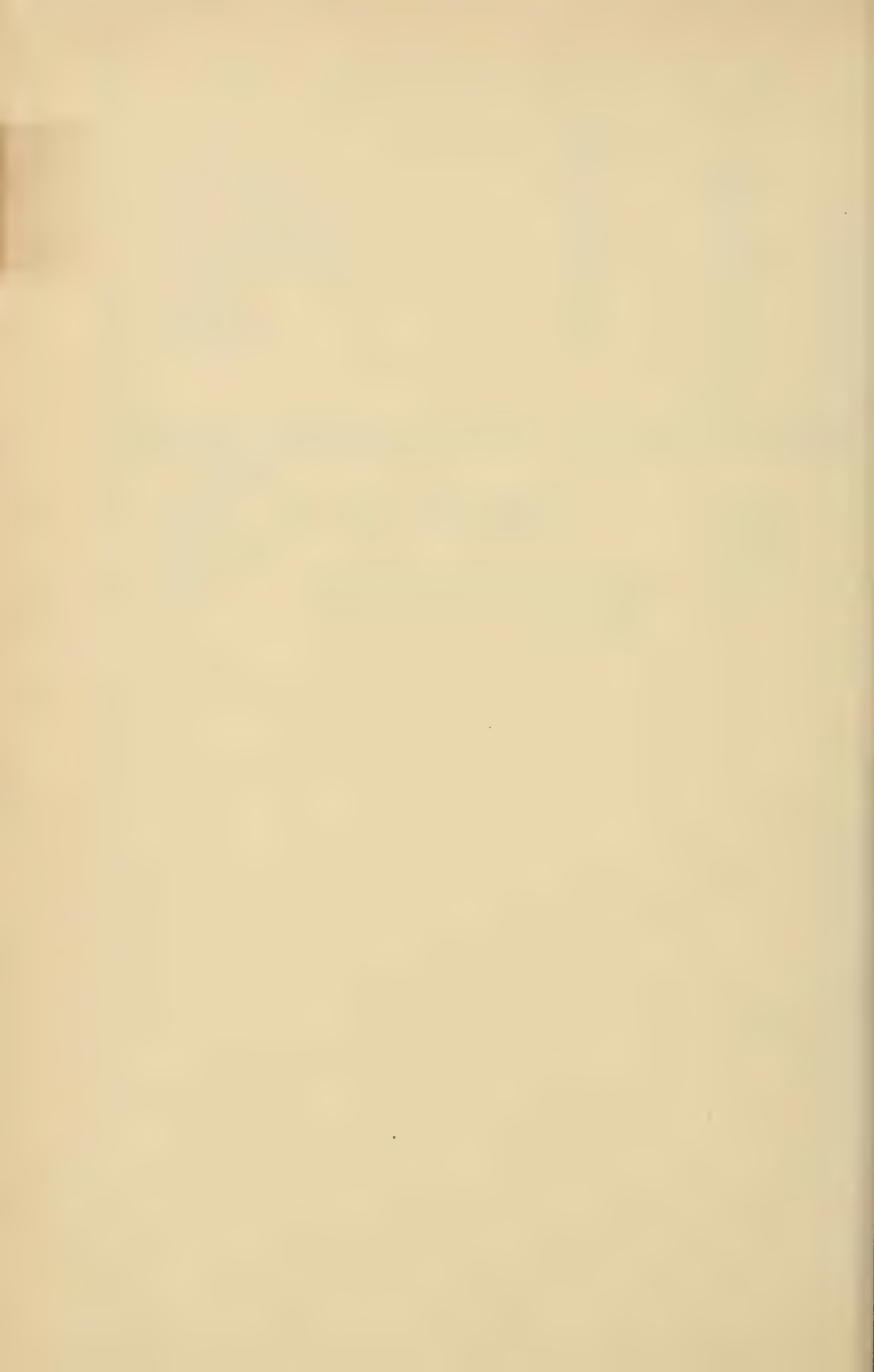
Branch	Rate Per Thousand	Absolute Numbers
Infantry	583.96	229,223
Signal Corps	101.74	2,128
Tank Corps	100.44	454
Field Artillery	73.11	11,146
Corps of Engineers	59.24	8,456
Medical Department	51.62	3,954
Quartermaster Corps	18.81	2,136
Cavalry	17.81	96
Air Corps	13.64	685
Ordnance	10.36	113
Others	30.29	2,392
Total		260,783

Classification of Death-producing Agents. Of the 50,385 deaths in the AEF classified as killed in action or died of wounds, the following table indicates the agent causing the casualty by percentages.

Gun-shot missiles, shrapnel, or shell, kind not stated	81.53%
Rifle and machine gun	7.02%
Mustard gas	4.38%
Other gases	4.47%
Others	2.60%

Part II

Medical Subjects



CHAPTER I

MEDICO-MILITARY HISTORY

EVOLUTION OF THE MEDICAL DEPARTMENT, U. S. ARMY

The Medical Department of the United States Army had its origin at the very beginning of our national history. In 1775, upon the recommendation of General George Washington, the Congress created the first military-medical service known in America. At this early period each of the widely separated forces was provided with its own medical service. There was no central medical organization. However, there was created the position of Director General and Chief Physician, the first appointee being Dr. Benjamin Church of Boston.

The evolution of the Medical Department into its present form has been based upon necessity and upon the constantly increasing need for its growth and development. The periods of greatest development correspond to the major military and political vicissitudes of the United States government. There are, however, two distinct basic eras: the period prior to central organization which occurred in 1818 when General Joseph Lovell became the first Surgeon General; the period of development since that time.

THE SURGEONS GENERAL OF THE U. S. ARMY

Chiefs of the Medical Department (1775-1942)

- 1775-1775—Benjamin Church, Director General and Chief Physician of the Hospital of the Army.
1775-1777—John Morgan, Director General and Physician in Chief of the American Hospital.
1777-1781—William Shippen, Jr., Director General of the Military Hospitals of the Continental Army.
1781-1783—John Cochran, Director General of the Military Hospitals of the Continental Army.
1792-1796—Richard Allison, Surgeon of the Legion.
1798-1800—James Craik, Physician General.
1813-1814—James Tilton, Physician and Surgeon General.
1818-1836—Joseph Lovell, Surgeon General.
1836-1861—Thomas Lawson, Surgeon General.
1861-1862—Clement Alexander Finley, Surgeon General.
1862-1864—William Alexander Hammond, Brigadier General, Surgeon General.
1864-1882—Joseph K. Barnes, Brigadier General, Surgeon General.
1882-1883—Charles Henry Crane, Brigadier General, Surgeon General.
1883-1886—Robert Murray, Brigadier General, Surgeon General.
1886-1890—John Moore, Brigadier General, Surgeon General.
1890-1890—Jedediah Hyde Baxter, Brigadier General, Surgeon General.
1890-1893—Charles Sutherland, Brigadier General, Surgeon General.
1893-1902—George Miller Sternberg, Brigadier General, Surgeon General.
1902-1902—William Henry Forwood, Brigadier General, Surgeon General.
1902-1909—Robert Maitland O'Reilly, Brigadier General, Surgeon General.
1909-1913—George H. Torney, Brigadier General, Surgeon General.
1914-1918—William Crawford Gorgas, Brigadier General and Major General, Surgeon General.
1918-1931—Merritte Weber Ireland, Major General, The Surgeon General.
1931-1935—Robert Urie Patterson, Major General, The Surgeon General.
1935-1939—Charles Ransom Reynolds, Major General, The Surgeon General.
1939.—James Carre Magee, Major General, The Surgeon General.
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The Medical Department remained loosely organized until the appointment of General Lovell as Surgeon General. For a time during the Revolution there was a semblance of centralization which was briefly revived during the war scare of 1798 and during the War of 1812. But as a regular procedure each regiment or post attended to its own medical affairs. Medical progress remained slow and uncertain with this lack of common interest and a considerable ignorance of preventive measures against contagious diseases. Nevertheless, during this period of disorganization, the amplified mistakes gave loud warnings which guided the medical service toward central organization. The results have been of benefit not only to the Army but to the health and economic progress of the nation as well. Perhaps it was in realization of the suffering and hardships of the American soldier in peace as well as war that Congress, in 1818, passed the bill which provided a Medical Department for the Army, appointed a Surgeon General, and set up a central organization. This basic framework has been continued and exists today.

This chapter records a chronological summary of many of the important and interesting developments, changes, activities, and achievements of the Medical Department and its members. They are listed according to period and exact date so far as possible. In addition, a very few of the major achievements of the department are discussed in some detail.

ERA PRIOR TO CENTRAL ORGANIZATION

1775-1812. THE PERIOD FROM THE REVOLUTIONARY WAR TO THE WAR OF 1812

1775

July 1. The Provincial Congress of Massachusetts, after the Battle of Bunker Hill and the use of several large homes as hospitals, fixed the medical personnel in two classes: for a hospital, two surgeons and two surgeon's mates; for a regiment, one surgeon and two surgeon's mates.

July 27. The Congress provided for the establishment of "an Hospital" for an army of 20,000 men. The need for this medical service was foreseen by General Washington soon after his initial inspections, and he recommended it in writing on July 21.

1776

The Army made the first request for women to care for the wounded. Wives, mothers, and sisters of the soldiers were used on the basis of one per each ten soldiers sick.

The equivalent of the present Hospital Fund was established by John Morgan, M.D., Director General and Physician-in-Chief of the Continental Army. With the counsel of General George Washington, and the assistance of regimental surgeons, he drafted the first hospital regulations for the American Army.

Dr. John Jones included in his book, which was the first American book on surgery, a chapter on camp and military hospitals.

The Continental Army retreated from Quebec, during which there was a smallpox epidemic. While orders forbade the use of inoculations, the soldiers themselves commonly put it into practice by self-administration.

1777

Benjamin Rush, a famed medical man of the Revolutionary period, published a pamphlet on the hygiene of troops entitled *Directions for Preserving the Health of Soldiers*.

Dr. William Shippen, Jr., Director General of the Military Hospitals of the Continental Army, drew up a plan for "flying" ambulances. These chariot-like ambulances were used to bring the doctors to the patients in the field rather than to bring the patient to the doctor.

Authority was granted to Director General William Shippen, Jr., and his deputies to utilize the services of surgeons, either in the hospital or with the regiments, as circumstances indicated.

1778

A resolution was passed by Congress to fine each officer who entered a hospital for the cure of venereal disease ten dollars; similarly, soldiers were fined four dollars. The money thus obtained was used for the purchase of blankets and shirts for soldiers who were sick in the hospitals. The results are unknown.

The medical administration was divided among three large territorial departments: Northern, Middle, and Eastern. Each department was authorized a "Physician and Surgeon of the Army," a "Physician General," a "Surgeon General," and a "Deputy Director General." Appointments were made for all positions except the "Deputy Director General" of the Middle Department.

The earliest pharmacopoeia for use of the Continental Army was prepared by Dr. William Brown, who was Physician General of the Middle Department. It was the first American pharmacopoeia.

1780

The first Army regulations were written. They contained a chapter on "Treatment of the Sick." This chapter was helpful and gave information which would still be considered as good common sense.

James Tilton, later Physician and Surgeon General, introduced log huts as hospitals. Most of the suffering of the sick was due to exposure.

1781

February. Congress appointed a Secretary of War, and medical reports heretofore sent to the Medical Committee of Congress were sent to him. Prior to this time, medical affairs had been regulated through the Medical Committee, which had been permitted to visit and inspect the hospitals and to make necessary investigations of the medical administration.

1784

June. All troops were discharged except 700. One surgeon and four surgeon's mates were retained to provide medical care for the Army.

1788

The number of troops in service was 595, most of whom were stationed on the western frontier. The medical officers were appointed by the States from which the troops were received.

1789

August 7. The War Department was organized as an executive department, four months after the inauguration of General Washington as President.

1790

The Regular Army was organized with a strength of 1216 enlisted men and a small number of officers. Three years was the length of service for both rank and file. The President was authorized to engage extra surgeon's mates as he deemed necessary.

1792

An Act of Congress reorganized the Army as a "Legion" under command of a major general and further divided it into four sub-legions, each commanded by a brigadier general. The chief medical officer on the staff of the major general commanding the "Legion" was titled "Surgeon of the Legion." Richard Allison was the first appointee to this position. Each sub-legion was authorized a surgeon and three surgeon's mates. While this law remained in effect for over a century, and was the only "militia law" during this period, it was never fully carried into effect.

1790-1798

The Army was increased by numerous additions to the strength of the regiments. Medical officers were appointed as regimental surgeons, but central organization of the Medical Department for these medical services was not provided.

1798

Because of fear of a war with France, an attempt was made to reorganize the Army and Medical Department. The Physician General, Dr. James Craik, was authorized the rank, pay, and emoluments of a lieutenant colonel. Medical officers were appointed for the regiments, but hospital appointments had not been considered. Secretary of War Dr. James McHenry, a surgeon during the Revolution, noted this omission and recommended to Congress that it be corrected.

1800

Since war with France was no longer feared, Congress passed a bill discharging all the troops raised for the increase of the Army, including the Physician General and all medical officers, except six surgeons and twelve surgeon's mates.

1800-1812

During this interval very little information is available concerning the medical service of the Army. It is known that there was no central organization of the medical staff, and there was no hospital department. Sanitation in the modern sense did not exist. The average soldier was without medicines or medical attendance and recovered from illness by the strength of his own physical resistance or died in misery.

1812-1818. THE WAR OF 1812 TO THE ADMINISTRATION OF GENERAL LOVELL

1812

Congress provided for the appointment of such number of hospital surgeons and surgeon's mates as the service might require. However, the organization of the medical service was haphazard, leaving the medical officers without authority and subjected to many interferences from line officers.

1813

Members of the Medical Department were given uniforms for the first time in the history of the Army. The uniform was black, with a very high collar in front.

1814

The first Medical Department regulations which dealt with the duties of medical officers were issued as part of the Army regulations.

Dr. James Tilton, Physician and Surgeon General, abolished the distinction between a physician and a surgeon. Since that time army medical officers have been known as surgeons, although their duties have never been limited to the surgical specialty.

1815

The army was reduced to one-sixth its former size, and the Physician and Surgeon General was discharged on June 15. The Medical Department's only activities until 1818 seem to have been receipt of reports made by medical officers who took part in the War of 1812. Francis Le Baron continued as Apothecary General until April 18, 1818.

Other Events during the Period 1812-1818

Early observations were recorded relative to the cleanliness and ventilation of hospitals. Although preventive measures as we know them now were not used, there was a faint realization that the hospitals which were kept clean and well ventilated had the least dissemination of disease. It was again demonstrated during the War of 1812 that the care of sick and diseased soldiers was a larger burden than the care of soldiers injured in battle. Contagious diseases and infections from wounds caused more deaths than enemy fire. It was early evidence that the mission of the medical service must be "to conserve the fighting strength of the military force."

ERA OF CENTRAL ORGANIZATION

1818-1836. SURGEON GENERAL LOVELL'S ADMINISTRATION

1818

An Act of Congress reorganized the staff departments of the Regular Army, including the Medical Department. A Surgeon General was appointed as head of the Medical Staff. All orders and instructions, reports, and communications in connection with medical affairs were ordered to be issued through the Surgeon General's Office. This was the first basic central organization and the beginning of definite progress for the Medical Department. Because of his excellent service in the Northern Division during the War of 1812, and his *Remarks on the Sick Report of the Northern Division for the year ending June 30, 1817*, Dr. Joseph Lovell was appointed the first Surgeon General of the United States Army.

November 1. Surgeon General Lovell submitted the first quarterly report of the Medical Department to the Secretary of War.

1826

The first meteorological report issued by the Army was dated 1826 and entitled, *Meteorological Register for the Years 1822-25 inclusive, from Observations made by the Surgeons of the Army at the Military Posts of the United States.* It was prepared under the direction of Joseph Lovell, M.D., Surgeon General of the U. S. Army.

1833

A medical officer and pioneer physiologist, Dr. William Beaumont, encouraged by General Lovell, made his abstract report on *Experiments and Observations on the Gastric Juice and the Physiology of Digestion.* This report was based on his experiments on Sergeant Alexis St. Martin, who developed a gastric fistula following a gunshot wound through his stomach.

1836

The "Library of the Surgeon General's Office" was founded. (This is the origin of the present Army Medical Library in Washington, D. C.)

Other Events during the Period 1818-1836

The Medical Department regulations were further revised.

An Act of Congress required professional examination for appointment in the Medical Corps of the Regular Army; the pay and simulated rank of medical officers were established. Surgeon General Lovell introduced weather reports and included them in his quarterly reports to the Secretary of War. Many studies were made by members of the Medical Department relative to febrile diseases which were then prevalent; these diseases at that time included scurvy, bilious remitting fever, dysentery, and dengue. In his reports General Lovell attributed much illness to the excessive consumption of spirituous liquor, and it is probably the result of his recommendations that the rum ration was discontinued.

1836-1861. THE PERIOD FROM GENERAL LOVELL'S ADMINISTRATION TO THE CIVIL WAR

1836

November 30. General Thomas Lawson succeeded Surgeon General Lovell but did not assume the duties of his office until 1838. He was occupied in organizing a battalion of volunteers for the Florida Seminole War.

1840

Members of the Medical Department were given a new uniform with an aiguillette instead of epaulettes, which met with serious objection from the medical officers. Surgeon General Lawson wrote a letter to the Adjutant General expressing his opinions substantiating those of the medical officers. The following year the epaulettes were restored. The letters "M.S." were placed on the epaulettes as a mark of distinction. However, it opened a long dispute about the rank of medical officers which continued until the Mexican War.

1841

The Surgeon General's Report for the year 1841 recorded the mean strength of the army as 9,748 officers and men, and admissions to sick report as 38,559. Of the latter, 320 were discharged from the service, 30 deserted, and 387 died. The above would indicate each soldier had been on sick report at least four times during the year.

1842

There was a marked reduction of the Army and the Medical Department following the Florida Seminole War.

1845

A general hospital and several regimental hospitals were established in anticipation of war with Mexico.

1846

May 13. President James K. Polk proclaimed a state of war to exist with Mexico and called for 50,000 volunteers; each new regiment was authorized to have one surgeon and one assistant surgeon.

William Lloyd Garrison, historian, stated the condition of the American troops in Mexico to be as follows: "There were no ambulances in the Army before 1859; only one hundred and eighty mule-drawn wagons were available on April 5, 1847; there were no shelter or hospital tents, hospital equipment, etc. Ignorance of the character of water supplies brought hundreds down with diarrhoea and dysentery; hospitals were hastily improvised in any convenient buildings, and the misery of the sick was increased by the squalor of Latin surroundings."

1847

An Act of Congress provided definite rank for medical officers.

Surgeon General Thomas Lawson recommended: an increase in the number of Medical Department officers; enlistment of competent and trained personnel as hospital stewards; extra-duty pay for hospital nurses and attendants detailed from the line.

1851

The first delegate from the Medical Department was sent to a meeting of the American Medical Association.

1855

The *Army Meteorological Register*, a separate weather data report, was prepared by a medical officer, Surgeon Coolidge. Previously the weather reports had been a part of the Surgeon General's quarterly report to the Secretary of War. The Medical Department submitted weather reports and other essential weather data for all stations from 1820 until the Weather Bureau assumed this task in 1855.

1856

Congress authorized the appointment of hospital stewards as had been previously recommended by Surgeon General Thomas Lawson in 1847.

1857

The caduceus of yellow silk worn on the sleeve was designated in Army regulations as the insignia for hospital stewards. The medical officer's uniform was similar to the line officer's except that the full-dress sash was an emerald green.

1857-1859

Medical Statistics, United States Army was published, the first part being completed in 1857 and the second part in 1859.

A study was made of medical transportation, and two types of ambulances were adopted.

1851-1861

Medical officers accompanied troops and furnished medical care during the Apache warfare in the southwest United States. They also provided medical assistance during the survey of the transcontinental railroads.

1861-1865. THE CIVIL WAR PERIOD

1861

Congress created the position of brigade surgeon and appointed 107 to this position. At this time Congress also authorized an addition of 10 surgeons and 20 assistant surgeons for the Medical Department, and allowed when necessary the use of female nurses with pay at the rate of fifty cents per day.

1862

William A. Hammond was appointed Surgeon General, the first medical officer to hold the rank of brigadier general with pay and emoluments of the position. Under his administration several important developments and recommendations were made. He issued orders requiring full and detailed reports about diseases and injuries which led

to closer professional supervision and improved the accuracy of statistics; the general hospitals were placed under the command of the Surgeon General; he started the Army Medical Museum; he added many books to the Library of the Surgeon General's Office; he made compilations for *The Medical and Surgical History of the War of the Rebellion*. He recommended the establishment of a permanent hospital in Washington, D. C., independent transportation for the Medical Department (ambulance corps), an Army Medical School, construction of hospitals by the Medical Department, and the establishment of a central laboratory; these recommendations were far-sighted and were executed many years later.

The "Letterman Plan" for the evacuation of sick and wounded was used successfully at the Battle of Antietam. It involved the use of field aid stations, ambulances, field hospitals, hospital trains, and general hospitals, upon which the present method of evacuation of sick and wounded in battle has been based. The plan called for an ambulance corps for each army corps, with two-horse vehicles, provided with two litters each, in the proportion of three ambulances for each regiment of five hundred. The ambulance corps was commanded by a captain; a lieutenant was provided for each division, one sergeant for each regiment, two privates and one driver to each ambulance, and one driver to each medicine wagon. The personnel was under the control of the Medical Director.

1864

General Hammond proposed that a plan similar to the "Letterman Plan" be adopted for the entire Army, and during the year this recommendation became law.

Other Events during the Period 1861-1865

During the Civil War, 1,057,423 sick and wounded were treated. There were 13,000 medical officers in the Union forces and 9,000 in the Confederate Army.

Many advancements in the Medical Department and in medical field service occurred during Surgeon General Hammond's administration. He was dismissed August 30, 1864, and Surgeon Joseph K. Barnes was appointed to succeed him. Later the findings and sentence of the court dismissing General Hammond were annulled, and he was retired as a brigadier general. He refused to accept retired pay and continued to lead an active and useful life until his death in 1900.

1865-1898. THE PERIOD FOLLOWING THE CIVIL WAR PERIOD TO THE SPANISH-AMERICAN WAR

1865-1898

The Civil War armies were demobilized and the Regular Army reorganized. However, by 1869 the Army was still further reduced by the action of the "Benzine Board"; the remainder was scattered to small stations in the South and on the western frontier. This increased number of stations was beyond the care of the small number of medical officers remaining in the Army, and authorization was granted to hire 264 assistant (contract) surgeons.

Eighty thousand dollars of the hospital fund on hand after the Civil War were used for the improvement of the Library of the Surgeon General's Office, and the first catalogue of this library was printed. It consisted of a pamphlet of 24 pages. (This library has reached international fame and is known as the Army Medical Library.) Lieutenant John S. Billings, Medical Corps, prepared the first printed catalogue of the Surgeon General's Library, a pamphlet of 24 pages. It was through the far-sighted efforts of Lieutenant Billings that the present Army Medical Library became a reality. He is recognized as one of the greatest medical officers of the United States Army.

An Act of Congress established the Hospital Corps.

The teaching of first aid to line officers and company bearers was instituted.

1866

Assistant Surgeon Albert J. Myer was made Colonel and Chief Signal Officer, the first officer to hold that position in the United States Army. Fort Myer, Virginia, was named in honor of this officer.

1867

A descriptive catalogue of the Army Medical Museum, Washington, D. C., was published.

1875

Colonel Jedediah H. Baxter, later appointed Surgeon General, prepared a report of *Medical Statistics of the Provost Marshal General's Bureau* which was published and is still used as a source of early statistical information.

1879

The *Index Medicus*, a monthly record classifying current medical literature, was originated by John Shaw Billings, a colonel in the Medical Corps.

1881

George Miller Sternberg, a medical officer and noted bacteriologist, discovered the pneumococcus. He also photographed the tubercle bacillus for the first time.

December. The caduceus, as a collar and a cap ornament, was adopted for the hospital stewards.

1885

Orders were issued by the Surgeon General directing that medical officers submit monthly sanitary reports.

1887

The Army and Navy General Hospital at Hot Springs, Arkansas, was completed and opened for patients. There were 16 beds provided for officers and 64 for enlisted men.

The law authorizing the organization of the Hospital Corps was signed by President Grover Cleveland. The uniform was trimmed in green with a red cross on a white arm band.

1888

The organization of the Hospital Corps neared completion and began to render valuable assistance to the Medical Department. The men transferred from the line to the medical service were given training in nursing and medical field work. They were soon utilized in the laboratories and in the operating rooms; they performed the duties of our modern nurse corps.

1890

A shield was adopted as a collar device for army officers, including the medical officers.

1891

The reports of Surgeon General Charles Sutherland indicated that the Medical Department was beginning to realize definitely the importance of sanitation in the housing of troops. Faults of construction, heating, ventilation, and drainage were recorded, but recommendations to improve these conditions went unheeded.

September 17. The radical defects of the medical departments of the organized militia units came to the attention of their medical officers, with the result that as a remedy they organized the "Association of Military Surgeons." This Association now includes medical department officers from all government services and is very active in the coordination of their activities. Its members receive *The Military Surgeon*, a monthly publication containing many timely and useful medical and military articles.

The objects and aims of the Association are to increase the efficiency of the Medical Services of the Federal Government both in peace and war by the further development of means to care for the sick and wounded and for the prevention of epidemics. This is accomplished by the following procedures: by mutual inspiration and improvement; by maintaining military practice as a specialty, well defined and clearly recognized; by constantly striving to improve military and naval medicine, surgery, and hygiene; by the creation of a living and growing body of medico-military literature available as a standard for permanent reference; by encouraging acquaintance between medical officers of the several services; by providing an interchange of views and ideas between these

medical officers; by establishing uniformity of procedure between the Medical Departments of the National Services and those of other countries; by preserving a medico-military *esprit de corps*; by maintaining the military position of the medical officer upon an equality in rank, authority, autonomy, and initiative with that of other officers; by encouraging legislation beneficial to the Medical Departments of all Services; by promoting a constant condition of readiness for duty in the Medical Departments of all of these Services.

The Association is the only organization in the United States which attempts to bring together and coordinate the efforts of the various medico-military services of the Federal Government.

The Association of Military Surgeons is now an incorporated body of medico-military men recognized by the Federal Government as a medical society organized to promote the specialty of military medicine, surgery, and sanitation. It was organized by the late Nicholas Senn, former Surgeon General of the States of Wisconsin and Illinois.

Active membership in the Association is open to: those who are, or have at any time been, commissioned officers in the Medical Department (or Service) of the Army, the Navy, the U. S. Public Health Service, the National Guard, the Organized Reserves, the U. S. Volunteers, and Acting Assistant or Contract Surgeons of these Services; regularly appointed members of the Medical Service of the Veterans' Administration and those who have been such; those who have been duly elected members of the Air Service Medical Association and of the Medical Veterans of the World War; officers of the Military Medical Services of other countries, and Medical and Dental Officers of the U. S. Indian Service.

The Association maintains an office in the City of Washington, where all business of the Association is transacted.

1893

Colonel George M. Sternberg, a pioneer bacteriologist in America, was appointed Surgeon General by President Grover Cleveland. Colonel Sternberg was the most professionally eminent officer in the Medical Corps and was in a position to achieve and conduct medical advancement. As Surgeon General he stimulated the professional zeal of all the medical officers of the Army. The Division Hospital at Manila, Philippine Islands, was later named the Sternberg General Hospital in his honor. It is the Army's largest and best hospital in the Philippines.

Authority was granted by General Orders No. 51, Adjutant General's Office, dated June 24, 1893, for the establishment of an Army Medical School. Originally, it was located in a building with the Army Medical Library and Museum, but the school has since grown, now having a special building at the Army Medical Center, Washington, D. C., where large numbers of medical, dental, and veterinary officers are instructed. It is a medical theater of scientific study, research, and instruction.

1894

The modified Maltese cross was adopted in place of the shield as a collar device for medical officers.

1895

The Medical Department adopted the metric system of weights and measures for pharmaceutical procedures and prescriptions.

A room especially well cleaned, in which the necessary anesthetics, medicines, and equipment were kept, was required in each station hospital for emergency operations. These emergency rooms were the origin of operating rooms in station hospitals.

The new international system of statistical reports was adopted.

The department also began to furnish medical officers with current medical facts by sending them recent publications. (This custom still continues, and there are now well equipped, local medical libraries at many station hospitals.)

Other Events during the Period 1865-1898

Many advances in medicine occurred in which the Medical Department of the Army took an important part. Medical officers who accompanied troops came into contact with many kinds of febrile diseases, the most common of which was typhoid fever.

Diphtheria antitoxin was used with success by the Medical Department of the Army soon after its discovery. The Roentgen ray was also used soon after its discovery; its value as an aid to diagnosis and as a means of record and identification was soon appreciated by the Medical Department.

The interest in bacteriology manifested by the civilian doctor, as well as the medical officer, soon brought to light the necessity for preventive measures to control the dissemination of contagious diseases. Field sanitation became of major interest, and military medicine started to have a prominent part in military affairs. Water and food supplies were becoming a matter for inspection and discussion. Scientific studies were being made by many officers.

1898-1899. THE SPANISH-AMERICAN WAR PERIOD

1898

April 21. There were 192 medical officers and 791 enlisted men in the Medical Department when war was declared. This was not sufficient for the peace-time Regular Army of 28,000. The necessity for expansion of the Medical Department was evident, and the task was made more difficult because of the lack of experience and field training of the medical officers. With incomplete knowledge of field sanitation, without field equipment, without general hospitals, the Medical Department was given a perilous mission.

April 22. An Act of Congress provided for an increase in the Medical Department of 8 corps surgeons, 110 division and brigade surgeons, and 650 contract surgeons.

During the year the "Central Hospital Fund" was designated by the Surgeon General as a reserve fund. Into this reserve the custodian of each station hospital fund, upon request of the Surgeon General, was required to transfer the money in excess of its normal primary needs.

May 12. Congress authorized the appointment of 15 assistant surgeons. In 1894 Congress had reduced the number of medical officers by the same number.

May 18. The Surgeon General directed that regimental hospitals be discontinued and their supplies used for the establishment of division hospitals. Division hospitals were kept mobile, serious cases being sent to general hospitals. Near New York and Philadelphia many patients were sent to civilian hospitals, and others were furloughed home for recovery.

May 31. The Adjutant General authorized the transfer of men from volunteer organizations to the Hospital Corps. There were about 6000 enlisted and transferred men in the Medical Department during the war, and that was far from an adequate number to render even the minimum service. By the utilization of female nurses as overseers these men accomplished a great deal and received training which was useful later in the Philippine Islands.

June 2. Congress increased the number of hospital stewards (sergeants) to 200. It was difficult to increase the size of the corps during the war and even more so after the occurrence of epidemics, because soldiers feared taking care of the sick.

June 9. Secretary of War Russell A. Alger approved the use of the facilities and personnel of the American National Red Cross Association during the Spanish-American War. General Sternberg commended on several occasions the record made by these Red Cross nurses during the period 1898-99, relating their skill, sincerity, and devotion to duty.

July 2. The Hospital Ship "Relief," a converted passenger steamer, sailed for Cuba to transport sick and wounded to Montauk Point, Long Island, New York. Montauk Point was the point selected as a camp for returning troops. The ship "Relief" was used later in service to the Philippine Islands.

August 18. The general hospital at Montauk was completed. The boat "Red Cross Yacht" reported to assist in transporting sick and wounded to New Haven, New London, and Bridgeport hospitals. Several other hospital ships were also used, most of which were converted commercial ships. In the Spanish-American War, through the Women's National Relief Association, a corps of selected expert cooks and assistants was furnished to the Chief Surgeon of the Camp at Montauk Point for use in the kitchens of the hos-

pitals. The Army ration was increased until it included a menu equal to the best hotels of large cities.

Other Events during the Period 1898-1899

Medical service for the various campaigns in Cuba, the Philippine Islands, and Puerto Rico was furnished by the Medical Department and the Red Cross. The care of the soldiers in the camps was entirely inadequate. Since typhoid fever was frequently diagnosed as malaria, a short period of time elapsed before typhoid was recognized epidemic in nature. The death rate from both diseases increased month by month.

"The Typhoid Fever Board" composed of Major Walter Reed, Major Victor C. Vaughn, and Major Edward O. Shakespeare, all of the Medical Corps, was directed to make a detailed study concerning the epidemiology of typhoid fever in the military camps in the United States. They concluded that typhoid fever was not a strictly water-borne disease, and that it could be, and was, spread by personal contact.

The first vision of a future Dental Corps became evident when Hospital Steward J. W. Horner was assigned as corps dentist, assisted by Acting Hospital Steward Watts. They opened an office and attended dental patients of the Seventh Army Corps free of charge.

General hospitals which had been established were continued. The missions assigned to the Army following the Spanish-American War prevented reduction of its strength to that prior to the war. Consequently, the necessity for medical care for this personnel existed. The Medical Department had come to realize the value of general hospitals for treatment of patients requiring special therapeutic measures under the care of specialists. Civilian hospitals were also increasing in number as it was the trend of the period. The general hospitals which were established during the Spanish-American War and continued afterwards were: Sternberg, Letterman, Tripler, the general hospital for the treatment of tuberculosis at Fort Bayard, New Mexico, and the general hospital at Washington Barracks, Maryland.

Due to the sudden emergency of the war and the inability of the Medical Department to secure sufficient enlisted men, the need for an organized nurse corps was realized. The Nurse Corps (female) was organized in 1899 without any specific authorization. The early history of the Nurse Corps was included in the Surgeon General's report for 1899. There were 1158 nurses in service on September 15, 1899; however, during the war contracts were made with 1,563 nurses.

The casualties of the Spanish-American War were relatively few. In the Army 22 officers and 244 men were killed; in the Navy 1 officer and 17 men were killed—a total of 284 deaths out of 235,631 men engaged in war. About 3,500 died because of disease; most of these deaths were due to the typhoid epidemic which was prevalent in the Army camps during the War.

The Medical Department won the favor of the American people and began to get the support and sympathy of the public. Since the public was interested the problems of the medical service were better known to them. The war service provided a valuable experience, consolidating members of the department into a cooperative and aggressive band of workers. It was a difficult but important period in the progress of medicine and the future of the Medical Department.

1899-1914. THE PERIOD AFTER THE SPANISH-AMERICAN WAR TO THE WORLD WAR

1899

As a result of the Spanish-American War and immediately after its termination, "The Dodge Commission" was appointed by President William McKinley to investigate and report on the conditions of the Army. The Medical Department was definitely included and its errors and needs investigated. Fulfilling the recommendations of the Dodge Commission occupied the attention of Army leaders for many years following the receipt of the findings.

April 11. The peace treaty, originally signed December 10, 1898, was finally confirmed. The strength of the Regular Army was then established at 65,000. The men enlisted for the Spanish-American War in the Hospital Corps were retained in the Philippines longer

than those who volunteered for service in the line; this was due to the necessity for improving sanitary conditions there.

1900

Medical personnel accompanied the troops who were sent from the Philippines to suppress the Boxer Rebellion in China. The sick and wounded were handled successfully, final evacuation being to San Francisco. (The Medical Department furnished personnel for medical care to Army troops in Tientsin, China, from the time the International Force of Occupation was established until the Army units were withdrawn in 1938.)

The Medical Department established the first "Tropical Disease Board." It was established in Manila, Philippine Islands, for the study and control of tropical diseases.

May. A board composed of Major Walter Reed, Major James Carroll, Dr. Jesse W. Lazear, and Dr. Aristides Agramonte was appointed by Surgeon General Sternberg to study the transmission of yellow fever. They began their investigations in Quemados, near Havana, Cuba a month later. This board demonstrated positively that yellow fever is transmitted by the bite of the mosquito *Aedes aegypti*.

1901

The Act of February 2 authorized a strength of 100,619 officers and men for the Regular Army; this included an increase of the Medical Corps officers from 192 to 321 and the hospital stewards from 200 to 300.

This same Act authorized the employment of thirty dental surgeons under contract; it also recognized and confirmed the establishment of the Nurse Corps (female).

All Medical Department personnel were directed to wear the caduceus as a collar ornament on the uniform. The Maltese cross previously used was discarded. Green was discontinued as the department color, and maroon, which is the present color, was adopted.

1903

March 2. The title of "Hospital Steward" was eliminated and the title "Sergeant First Class" substituted by the Act of March 2, 1903. The same Act provided that the Hospital Corps would consist of sergeants first class, sergeants, corporals, privates first class, and privates.

National Guard medical units were organized to provide field medical service to the rear boundary of the division.

Major William C. Gorgas reported that he had succeeded in the campaign against yellow fever and that no new cases of this disease had originated in Cuba for two years. Major Gorgas had successfully put into practical application the principles established by Major Walter Reed and his board. He conceived of a triple threat against yellow fever: first, destruction of mosquitoes; second, prevention of mosquito breeding; and third, protection of yellow fever patients from bites of mosquitoes. To accomplish this task, he organized a "Stegomyia Brigade," an "Anopheles Brigade," and a "Yellow Fever Brigade." The first two were used for the prevention of mosquito breeding and the latter for the destruction of mosquitoes within houses occupied by yellow fever patients.

In spite of shortage of medical officers, the Surgeon General loaned officers to other government services to assist in important scientific work. Captain B. K. Ashford was placed at the disposal of the insular government of Puerto Rico to carry out a campaign against a "tropical anemia" due to hookworms. This policy continued for many years afterwards, and included the assigning of Colonel William C. Gorgas and five other medical officers to Panama and Major J. R. Kean to the governor's staff in Cuba. The latter, assisted by four other medical officers, guided the sanitary department of the island.

1904

Brigadier General Fred C. Ainsworth, who had been in charge of the Division of Records and Pensions in the Surgeon General's Office, was made the Military Secretary. Later, when the title was changed back to "The Adjutant General," he continued to hold the position.

1906

March 21. The second "Tropical Disease Board" was established (W. D. Special Orders No. 16, January 19, 1906) in Manila, Philippine Islands. The more important

work of this board and the previous board established in 1900 included the following: the confirmation of the mosquito theory of dengue transmission; discovery of a new species of filaria, malaria; studies in *amoebiasis*, leprosy, cholera, and yaws; extensive observations regarding the influence of tropical climates; investigations as to the causation of beriberi; eradication of beriberi among Philippine Scouts; discovery of a cure for infantile beriberi; determination of the amoebicidal properties of emetin, as a result of which that drug became the established specific for amoebic dysentery; investigations regarding surra in horses; studies as to the prevalence of typhoid fever and diphtheria in the Philippine Islands; experiments on the effect of ultraviolet light upon amœbæ; experiments regarding the relative value of different uniform materials and military head coverings for use in tropics; observations on pulse rates, blood pressure, and blood composition in the tropics. This second board continued until October 24, 1914, when the board was dissolved.

The first motor ambulance was obtained for the Army and placed in use at Washington Barracks, Maryland.

President Theodore Roosevelt instituted the annual physical examination for all field officers. He had developed a keen interest in medical affairs during the Spanish-American War.

1907

April. President Theodore Roosevelt appointed the Panama Canal Commission of which Colonel William C. Gorgas, Medical Corps, was a member. The combination of Army administration and competent field sanitation was a paramount necessity; the United States had selected the tools to conquer the jungle, which had defeated former attempts because of disease.

1908

Major F. F. Russell, Medical Corps, submitted a report on the epidemiology of typhoid fever. He had studied about its effects in foreign armies while he was in England. After receipt of his report, a board was appointed which reviewed the history of vaccination against typhoid with the view of its use in the protection of troops. The findings and recommendations of this board led to the adoption of antityphoid inoculation in the United States Army. The Army was the first institution to establish the use of typhoid vaccination on a large scale and to definitely determine its value in preventive medicine.

Acts of Congress made the following changes and provisions for the Medical Department: The Medical Reserve Corps was created and assignments to active duty permitted; the Medical Corps was increased by 6 colonels, 12 lieutenant colonels, 45 majors, and 60 captains or first lieutenants; promotion to the grade of captain was provided after three years' service; an increase in strength of the Medical Corps by four annual increments was provided; the pay of the Army was increased; examination for promotion to all grades of the Medical Corps below surgeon general was established.

The commissioned medical personnel of the Medical Department was designated as the "Medical Corps of the United States Army".

During this year a large collection of medical field equipment and supplies was stored for national emergencies, a practice which has been very helpful in many peace time disasters.

The preparation of typhoid vaccine for use in the Army and in other government services was started at the Army Medical School, Washington, D. C.

The Walter Reed General Hospital was built at Washington, D. C. It was named in honor of Major Walter Reed who headed the board that made the discovery of the means of transmission of yellow fever.

1909

February. The typhoid vaccine prepared at the Army Medical School was ready for use, and the War Department approved volunteer antityphoid inoculation. During 1909 it was given to 830 individuals.

Voluntary venereal prophylaxis was started. Since 1903 the Surgeon General had noted the prevalence of venereal diseases on the sick reports. This was a further step in the attempt to cut down the venereal rate of the Army.

1910

Leonard Wood, Captain and Assistant Surgeon, was appointed major general and Chief of Staff of the Army, the first medical department officer to attain that rank and position.

The first medico-military problem given in an Army school was solved by officers of the line in the Army Service School, Fort Leavenworth, Kansas.

Major John S. Morrison, Assistant Commandant and senior instructor in Military Art of The Army Service Schools, realized the need of medical information in the line, and in collaboration with Major P. M. Ashburn of the Medical Corps published a book *A Study in Troop Leading and Management of the Sanitary Service in War*. The disposition of medical troops and installations for a division were presented under various tactical situations.

Medical Service in Campaign by Major Paul F. Straub, Medical Corps, was also published. The need for careful consideration of the medical field service had developed a new field of tactical research.

Major C. R. Darnall, Medical Corps, originated the liquid chlorine method of water purification. Although not as widely celebrated as other medical feats, this method of water purification has been adopted throughout the world and probably has saved and will save more lives than any other single medical achievement.

1911

March 3. An Act of Congress established the Dental Corps of the Regular Army, consisting of 60 dental surgeons, as a part of the Medical Department.

November 13. A general order of the War Department was issued designating the large hospital at the Presidio of San Francisco, California, to be named Letterman General Hospital in honor of Surgeon Jonathan Letterman, who did so much for the organization of field medical service. There is also a field at Carlisle Barracks, Pennsylvania, used for demonstration of medical field service, appropriately named in his honor.

During the latter part of 1911, the War Department granted the request to establish the "Field Service and Correspondence School of Medical Officers" at Fort Leavenworth, Kansas. A six weeks course limited to 12 officers was started the next year. Six Medical Corps officers of the Regular Army and six medical officers of the National Guard attended. The school continued until the World War, and thereafter it was transferred to its present location at Carlisle Barracks, Pennsylvania.

Antityphoid immunization was made compulsory for all members of the Army, and inoculation was put into practice on the Mexican border.

1912

April 24. The National Red Cross was recognized by Congress. The President was authorized to employ its facilities with the Army and Navy according to such rules and regulations as he deemed best.

August 24. An Act of Congress consolidating the Quartermaster's Subsistence and Pay Departments included the "Manchu" provision, which required all officers of the Regular Army to serve two years out of each six with troops. This inclusion prevented medical officers from remaining on duty in Washington, D. C. on permanent assignment.

September 10. The Surgeon General announced a policy and issued regulations governing the operation of Red Cross units with the Army in time of war.

Major Edward L. Munson, M. C., as president of the "Army Shoe Board" devised the "Munson Last" for Army shoes. It was adopted by this Board for the Army and has since been adopted by large numbers of the civil population.

1914-1918. THE WORLD WAR PERIOD

1914

Colonel William C. Gorgas completed his medical service in Panama, where he had been the Chief Sanitary Officer during the construction of the Panama Canal. The first boat passed through the Canal on August 3, 1914.

Colonel Gorgas had achieved so much fame by the use of practical means in eliminating yellow fever from Cuba and Panama that it was evident he would succeed Surgeon General George H. Torney as head of the Medical Department. General Torney died suddenly of pneumonia on December 27, 1913, but Colonel Gorgas did not hear of his own appointment until later because he was in South Africa advising on the control of pneumonia. Well known and esteemed by the medical profession, he had been elected President of the American Medical Association in 1908. The successful completion of the task in Panama opened the eyes of the world to the value of preventive medicine. The Medical Department of the Army received recognition as well as the confidence and gratitude of Congress, of the Army, of the civilian medical profession, and of the American people. The health, economics, and commerce of the nation and world had been affected by application of simple sanitary measures within a strategic geographical area.

Colonel Gorgas was appointed Surgeon General with the rank of major general, the first surgeon general to attain that rank.

Due to the prestige of General Gorgas, Congress respected his council and advice; consequently the Medical Department progressed rapidly. It was fortunate that such confidence should exist at a time when, unknowingly, the nation was approaching a war that minimized by its immensity all previous warfare.

In 1914, the War Department issued *New Tables of Organization and Field Service Regulations*.

Medical officers began to take active training in field work and medical tactics. They participated in field maneuvers.

1916

The strains of paratyphosus "A" and "B" were added to the typhoid vaccine used by the Army.

Venereal prophylaxis was made compulsory, and a monthly physical inspection of enlisted men was instituted.

June 3. Congress passed the National Defense Act. Some of the provisions of interest to the Medical Department were as follows: a Regular Army limited to 175,000 enlisted men; reorganization of the Dental Corps providing grades of first lieutenant to major; organization of the Veterinary Corps (formerly civilian employees of the Quartermaster General's Department) as a part of the Medical Department, with rank from second lieutenant to major.

Reserve hospital and ambulance units were organized by the Medical Department in cooperation with the American Red Cross. The American Red Cross base hospitals previously organized were the initial and earliest American medical installations and service in the World War.

George P. Foster, Captain, Medical Corps, demonstrated that certain colds (upper respiratory infections) were due to an invisible and filterable virus.

1917

April 6. War was declared on Germany by the United States, and the Medical Department like other departments of the Army began a tremendous expansion. It was necessary to establish two separate medical services: a medical service for the theater of operations in France and another for the zone of the interior in the United States.

Fortunately, the Medical Department was not entirely unprepared for its task. The Medical Reserve Corps and the American Red Cross were in existence and were of invaluable aid. Much had been learned about field sanitation. Immunization against typhoid and smallpox was universally used. Nevertheless, a new medical problem in respiratory diseases appeared in the form of the influenza epidemic.

At this time the personnel strength of the Medical Department was recorded as follows: Medical Corps, 833; Dental Corps, 86; Veterinary Corps, 62; Nurse Corps, 403; and enlisted men, 6,619. There were in the Army 131 station hospitals, 4 general hospitals, and 5 temporary base hospitals, the total of which furnished a bed capacity of 9,530.

So many expansions of the Army began to take place at the same time that the facilities and personnel of the Medical Department had to be increased and made flexible to meet

new demands, as well as to carry on the increase of its normal work. It resulted in the creation of additional subdivisions and several independent divisions of administration, most of which were organized during 1917 and the early months of 1918. The five divisions which were already in operation were: Personnel; Sanitation; Supply (including Finance); the Army Medical Library and Museum; and the Division of Records, Correspondence, and Examining.

Since the Division of Sanitation handled all professional subjects, it was evident that it would receive the majority of subdivisions, which were the following: Hospitals, Overseas Hospitals, General Surgery, Military Orthopedic Surgery, Head Surgery, Internal Medicine, Neurology and Psychiatry, Laboratories and Infectious Diseases, and Roentgenology. The other four original divisions were divided into sections but, in general, remained intact.

The new and independent divisions were: Psychology, Gas Warfare, Foods, Air Service, and Physical Reconstruction. The Dental, Veterinary, and Nursing Divisions were closely associated with the Personnel Division and coordinated their activities with the administration division pertinent to their respective affairs.

A Sanitary Corps was organized to furnish the necessary technical assistance to the Medical Department officers. The members of this Corps were selected from highly trained and educated civilians with technical knowledge that made them valuable in laboratories and other auxiliary medical tasks. After the close of the World War many of the Sanitary Corps officers were commissioned as Medical Administrative Corps officers in the Regular Army; others continued in the Sanitary Corps Reserve. A regular peace-time Sanitary Corps of the Regular Army does not exist, but it is a corps of the Medical Department Reserve.

To facilitate the early use of the Medical Department of the United States Army a request was made by the French Army for an Ambulance Service. In response to this request a commissioned Ambulance Service Corps was established. It was discontinued after the World War.

Three hundred medical officers were sent to Great Britain and placed in training camps. This number was later increased to 1300. Upon completion of training, medical units were furnished to Great Britain, France, and Italy.

The bulk of the Medical Department officers was furnished by the Reserve Corps of the Medical Department. The Nurse Corps received its increase from the Red Cross Reserve. The additional enlisted men were drafted men or volunteers. The National Guard units in the war supplied their own medical personnel.

With the cooperation and the confidence of the American public, the interest and activities of the American Medical Association and other professional societies, the Medical Department went swiftly ahead with a medical program that was carried out not only efficiently but to a size never matched or visualized before.

Medical activity and progress in the zone of the interior was not limited to the Medical Department of the Army. Civilian institutions made their facilities available for training of the Medical Department officers and enlisted men. Linked with the training camps and schools this speeded up their preparation for war duty and permitted many more to be taught at the same time. The Red Cross filled all the needs for trained nurses; however, looking ahead into the future, the Army started the Army School of Nursing at Walter Reed General Hospital, Washington, D. C., with branch units in all military hospitals.

The influenza epidemic during 1917 and 1918 was a large medical problem of generalized national intensity. The civilian doctors, decreased in numbers by their colleagues in the government services, were taxed by many hours of vigilant duty. By no means did the epidemic miss the men in uniform. The World War casualties did not present any duties comparable to the control of this epidemic of respiratory disease known as influenza, and which so readily became complicated by pneumonia. There were 24,575 deaths among the officers and enlisted men of the American troops from this disease alone during the World War.

May. Since November, 1915, the Medical Department had been tentatively assigned the

task of furnishing gas-defense equipment but in May, 1917, it became a definite responsibility. A special division of the Medical Department was organized and placed under the charge of Colonel W. P. Chamberlain, Medical Corps.

May 8-19. During this period six fully equipped base hospitals had been shipped from the United States and were on the way to Europe. These hospitals were ready for operation before General John J. Pershing, the Commander in Chief of the American Expeditionary Force, arrived the latter part of May.

June. Colonel William J. Mayo, Medical Reserve Corps, was asked to report to Washington, D. C. to act as an adviser in organizing the Division of Surgery. The Medical Department profited a great deal by the cooperation and interest of Colonel Mayo and other capable medical men who were interested in the welfare of their nation. It can also be said that they in turn gained new professional knowledge and thereby profited by their Army experiences.

June 13. There were with the American Expeditionary Force in Europe seven medical officers and two enlisted men of the Medical Department. The organization of the Medical Department of the American Expeditionary Force was not yet established, but plans were being completed rapidly.

July. The Hospital Division of the Medical Department was created and Colonel Robert E. Noble (later Major General) was placed in charge. This division made plans and provisions for constructing and establishing the necessary hospitals. In some instances entire army posts were converted into hospitals. By autumn 44,000 beds were available for use in the large camps of the United States. This division was afterwards headed by Colonel (later Brigadier General) James D. Glennan who, on completing the necessary hospital provisions in this country, sailed for France and took charge of the Division of Hospitals in the Chief Surgeon's Office of the American Expeditionary Force.

In July the Chief Surgeon's Office was established in Chaumont, France. As the administrative departments of the American Expeditionary Force simulated those of the War Department, so the Chief Surgeon's Office simulated the Surgeon General's Office and was organized accordingly with almost identical divisions and subdivisions.

The Medical Department of the American Expeditionary Force early received the whole hearted support of General Pershing, resulting in the rapid development of the American medical service in Europe.

August. The Division of Physical Reconstruction was created for disabled soldiers, Colonel Frank Billings, Medical Corps, being placed in charge. The purpose of this division was to secure for disabled soldiers the proper facilities for treatment and care which would restore them to the best possible health.

September. Major Theodore C. Lyster, Medical Corps, was assigned Chief Surgeon of the Air Service for the purpose of organizing a specialized service, giving particular attention to aviation medicine. Necessary specialists and equipment were made available and a central testing laboratory was established at Mineola, Long Island, New York.

September 4, 11:00 p.m. First Lieutenant William T. Fitzsimons, Medical Reserve Corps, United States Army, was killed by an enemy airplane bomb that was dropped in the area of General Hospital No. 11, British Expeditionary Force, near Camiers, France. Lieutenant Fitzsimons was the adjutant of the United States Army Base Hospital No. 5 which was operating General Hospital No. 11 of the British Expeditionary Force. He was the first American officer to be killed by the enemy during the World War, and in recognition of his death the War Department named the largest army hospital at that time "The Fitzsimons General Hospital." This hospital is located at Denver, Colorado.

The same night, a little later and in the same area, another enemy bomb killed Private First Class Oscar C. Tugo of the Medical Department. He was the first enlisted man of the United States Army to be killed during the World War. Tugo Hall, the gymnasium building at Carlisle Barracks, Pennsylvania, was named in his honor.

October 18. A medical board was established by the Adjutant General's Office for the consideration of all matters pertaining to the physical examination and physical standards of airplane pilots.

October. The Food Division was authorized and Lieutenant Colonel John L. Murlin, Sanitary Corps, was placed in charge. The purpose of this division was to improve cooking, to prevent waste, to secure better balanced diets, and to increase the nutritional value of foods served in the Army.

General John J. Pershing made a request for the appointment of a Superintendent of Nurses for the American Expeditionary Force, and Miss Bessie S. Bell, a former chief nurse of Walter Reed General Hospital, was selected and assigned the position.

November. In the American Expeditionary Force, the issue of gas-defense equipment was turned over to the Chemical Warfare Service.

December. The Sanitary Corps had trained 186 officers and 1199 enlisted men who later were transferred to the Engineer Corps.

There was now in the Medical Department of the American Expeditionary Force a hospital bed capacity of 63,000. Plans had been made in October for 200,000, and this was the progress for the two months' construction.

1918

January. The Research Laboratory for Aviation Medicine was completed at Hazelhurst Field, Long Island, New York.

The Division of Psychology was established with the object of eliminating mental defectives and to classify personnel examined for special services. It was originally a section of the Division of Neurology and Psychiatry. Major Robert M. Yerkes was placed in charge. Before the Armistice was signed, 1,151,552 men had been examined, and a large research problem in psychology had been performed.

February. The Service of Supply (S.O.S.) of the American Expeditionary Force was organized. This S.O.S. included the Medical Department and had headquarters at Tours, France. It was divided into sections, each section having its own section surgeon. Because of the close friendship and the cooperative spirit of the heads of the medical departments of the S.O.S. and the zone of the armies, this arrangement worked out harmoniously.

March. There were 2,099 nurses from the United States in service in France, 700 of whom were serving with the British forces.

April 28. Colonel Merritte W. Ireland, M.C., was made a brigadier general and The Chief Surgeon of the American Expeditionary Force, replacing General A. E. Bradley who became ill and was invalided home. General Ireland had a thorough knowledge of the department as he had been serving as assistant to General Bradley. General Ireland was the original choice of General Pershing for Chief Surgeon, but General Bradley was senior to him and General Ireland expressed his thorough willingness to serve as General Bradley's assistant.

May 25. The Secretary of War authorized the establishment of the Army School of Nursing at the Walter Reed General Hospital, Washington, D. C. This school trained many nurses who after the war returned to civilian life and fostered a fine reputation for their professional training school.

June. The hospital-bed capacity of the Medical Department in the United States had expanded to 73,066, and construction was in progress for an additional 16,799.

The combat forces had so many sick and wounded in France that the Chief Surgeon, General Merritte W. Ireland, cabled to the United States for all available assistance. The Medical Department of the American Expeditionary Force, as of June 1, consisted of 5,198 officers, 2,539 nurses, and 30,574 enlisted men.

The responsibility of the Medical Department of the United States Army for furnishing gas-defense equipment was turned over to the Chemical Warfare Service. Prior to this date, however, the Medical Department had already furnished 1,718,000 gas masks, 502,000 extra cannisters, and 154,000 horse masks.

July 9. An Act of Congress provided that the Nurse Corps (female) would be known as the "Army Nurse Corps of the United States Army".

August. The personnel of the Medical Department of the American Expeditionary Force had increased to 9,601 officers, 4,735 nurses, and 67,144 enlisted men.

The United States Army sent an expedition to Eastern Siberia with a force of 8,831 officers

and men. The medical personnel of this expedition consisted of 698 officers and men. Activities of this expedition extended as far as 1,700 miles away from the base at Vladivostok. Medical statistics show that there were 8,100 admissions to sick report and 86 deaths.

Another large American Expeditionary force of 4,477 officers and men was sent to Archangel, Siberia in August, accompanied by the necessary medical personnel. Total admissions to hospitals were 2,352. There were 104 deaths in hospitals, and 82 deaths occurred in battle.

General Merritte W. Ireland, the Chief Surgeon of the American Expeditionary Force, in recognition of his able and outstanding service, was promoted to the rank of major general. His responsibility and activity were proportionate to the rapidity of expansion and the burden of the Medical Department at this period.

August 22. The War Department regained control of the Carlisle Barracks Military Reservation, previously administered by the Department of the Interior.

September. Medical activity of the World War was at its peak. Influenza was adding to the task of the Army, especially the Medical Department. Nevertheless, according to reports received from active combat units, the average elapsed time from the soldier's receipt of a battle wound until he reached a field hospital was about five hours. The average elapsed time from the front line to an evacuation hospital was ten hours. Many factors altered the time element, but in spite of all obstacles few if any went without medical care. The wounded arrived at the base hospitals in train loads of 300 to 500 men, with several train loads per day.

During this month, 52,762 short tons, approximately 6,331,440 cubic feet, of medical supplies were shipped across the Atlantic Ocean to the American Expeditionary Force. The equipment for sixty base hospitals of 1,000 beds each was also available and awaiting shipment.

The Veterinary Service was organized temporarily as a part of the Remount Service.

October 4. General Merritte W. Ireland was appointed Surgeon General, succeeding General William C. Gorgas. Brigadier General Walter D. McCaw became the Chief Surgeon of the American Expeditionary Force. General Ireland had built up a large, efficient Medical Department in foreign territory, and in less than six weeks the task of demobilizing this same organization to include the zone of the interior would become his responsibility. The Army consisted of over three and one half million men, who would have to be examined physically and returned to peace-time activities.

November 11. Armistice Day terminated the World War combat activities, but it did not end the duties of the Medical Department and other Army services. At the close of the war the Medical Department itself had expanded to: Medical Corps, 30,591; Dental Corps, 4,620; Veterinary Corps, 2,002; Sanitary Corps, 2,919; Nurse Corps, 21,480; and enlisted men, 281,341. The Medical Department was larger by 100,000 than the entire Regular Army of 1939.

There were 76,964 patients in base and general hospitals of the United States and 193,026 patients in hospitals of the American Expeditionary Force, a total of 269,990 patients who were undergoing active treatment on November 11. The normal bed capacity of the hospitals of the American Expeditionary Force was 192,844, with an emergency expansion capacity to 276,347. There were 153 base hospitals, 66 camp hospitals, and 12 convalescent camps in France.

The maximum strength of medical personnel in the American Expeditionary Force during the World War was 18,146 medical officers, 10,081 nurses, and 145,815 enlisted men. The bed capacity of 91 large hospitals in the United States totaled 120,916. Construction was in progress for 25,000 more beds, and plans had been made for an additional 60,000 beds.

The Medical Department during the World War treated 4,000,000 sick and wounded in hospitals, and over 7,000,000 men were given physical examinations. Besides this professional work there were many administrative duties. The Medical Department in both the zone of operations and the zone of the interior maintained and operated hospitals, laboratories, medical supply depots, hospital trains, training schools, and numerous other essential medical activities.

Approximately \$314,544,000 were spent to accomplish the medical missions of the United States during the World War, which was only 2.2 per cent of the total war expenditure of \$14,244,061,000. The medical service extended to Great Britain, France, Italy, Siberia, and, after the Armistice, to Germany.

The files of the Surgeon-General's office record the medical service of the World War as follows:

"Each soldier of the A.E.F. was provided, as a part of his individual equipment, with either a Medical Department regulation first aid packet or a front packet, enclosed in a metal case . . . comprised of two gauze bandages, three and one-half by three and one-half inches, two gauze bandages, four by eighty-four inches and two safety pins. The packages contained definite directions for application. Medical Department enlisted men assigned to the battlefield carried usually in a duffle bag or gunny sack a liberal quantity of these packets and also iodine swabs. This was important because of the frequency of multiple wounds and of the frequent lack of a packet on the person of the wounded by reason of its having either been lost, or, contrary to instructions, applied to a wounded comrade.

"The idea was to apply first aid immediately at the place where the wound was incurred, either by Medical Department personnel on duty with organizations in the front line or serving as litter bearers, or by litter bearers detailed from the line who were instructed in elementary first aid.

"Company Aid Station.—In some instances stations subsidiary to battalion aid stations were established in the front line for each company, conducted by two dressers assigned from the battalion medical personnel. At these company aid stations emergency treatment was given the wounded brought thereto usually by line litter bearers.

"Such stations were more commonly used in trench warfare when it was possible to keep a small supply of surplus dressings and even splints, and sometimes a battalion medical officer took station there; but in open warfare the only available dressings were those carried on the person, and often the only shelter was that afforded by a shell-hole, consequently the wounded habitually were borne to the battalion aid station.

"The Battalion Aid Station.—In trench warfare, battalion aid stations usually were located in dugouts in the support line, two hundred and fifty to one thousand yards in rear of the front line, on or near an evacuation trench. Briefly, the equipment, in addition to that enumerated in supply tables for a battalion, consisted of medical and surgical supplies adequate for a modern emergency first aid room. It included at least two Thomas splints, and a shock table for warming patients. Light was supplied by simple petroleum lamps, and in some electricity was present. Cooking was done below, when possible, coke or any available fuel being used and ventilators having dampers for excluding gas, led to the surface. . . . The source of heat was small wood-burning stoves. . . . Supplies were usually brought up by battalion medical carts . . . and habitually included stimulants and ample facilities for the preparation of hot liquid foods, and other articles of food were also stocked, as often in periods of intense bombardment patients could not be evacuated until after dark. . . . With respect to surgical treatment, the procedures which obtained in the battalion aid stations may be summarized as follows: (1) Revision of first aid dressing. Pain, when present, was usually due to constriction of the wounded parts by gauze and bandage, which required changing or loosening. (2) Revision of splinting to insure proper immobilization for subsequent transportation. Application of the Thomas leg or arm splint when traction was indicated.

"To arrest severe hemorrhage whenever the element of time, available surgical facilities, and good surgical judgment permitted, the bleeding artery was sought in the wound and ligated above and below its laceration. . . . Only dire necessity justified the evacuation of a patient with tourniquet on arm or thigh. . . . The maintenance of the body heat of the wounded by means of blankets, coats, hot water bottles, canteens filled with hot water, and hot drinks (when not contraindicated by the nature of the wound) was vastly important. . . . Antitetanic serum was administered habitually, even in case of an apparently trivial wound, and the fact of administration recorded on the field tag, and indicated on the patient's forehead by a cross painted with iodine. If the

wound or dressings involved the forehead, the cross was painted on the dorsum of one hand. The standard dose of morphine, one-fourth grain, was given immediately to all severely wounded, and to those slightly wounded in whom the element of pain was considered to be a factor in the development of shock. Often it was found advantageous to repeat the dose. . . .

"In battalion aid stations, it was usually impossible for the surgeon to scrub his hands and change gloves for each wound treatment: Water and gloves were not always available, or the supply was limited. However, instruments could be sterilized sufficiently by immersion in alcohol or ether, and by experience, the surgeon could easily learn to dress all wounds without having his hands make contact with septic tissues or objects. With two pairs of dressing forceps, or with one pair each of artery and dressing forceps, he could accomplish any kind of dressing and continue with a series of cases without scrubbing his hands or changing his gloves after completion of each. . . .

"The Dressing Station.—The number and locations of divisional dressing stations were dependent upon the roads, available shelter and the width and activity of the divisional sector; generally from one to three to a division, located from three thousand to six thousand yards from the front line.

"In trench warfare the dressing station, usually located in a dugout or in any available building, contained a greater amount and variety of equipment than was possible in open warfare, and had separate rooms for such purposes as receiving, recording and dressing the wounded, for shock treatment, the serving of hot foods, and for administration. Since more time was available for the care of men brought to the dressing station than was true in open-warfare conditions, many who were merely exhausted were returned to duty after a few hours' rest during which they were given hot food; also, casualties depleted by hemorrhage or suffering from shock could be retained longer and consequently evacuated in better conditions. The personnel usually worked in shifts.

"Each dressing station was placed as near the front as conditions permitted, the location selected being generally with a view to its subsequent occupation by a field hospital as the action developed. . . .

"The function of the dressing station in general was to receive casualties, to administer indicated emergency treatment, and to evacuate to designated destinations when conditions permitted, but, habitually, to field hospitals. The emergency treatment comprised arresting hemorrhage, readjusting dressings, applying or readjusting splints, administration of morphia and of antitetanic serum, when time permitted, stimulation by hot drinks, and the retention and reviving of gassed and shocked cases as far as possible. Operations were limited practically to the closure of aspirating wounds of the chest, and to emergency ligations.

"The Field Hospital.—The field hospital was the last and largest divisional unit of the Medical Department in the chain of evacuation, the function of which, in general, was to receive casualties from the dressing station, and to institute all measures possible under varying conditions to best fit them for continued evacuation, usually to evacuation hospitals. Field hospitals were located from three to eight miles from the front line, depending upon such factors as the enemy range of fire, roads, fuel, water, availability of buildings, and the location of evacuation hospitals. Whenever possible they were grouped, preferably in a village or at the confluence of roads from the sector served, for convenience both in the interchange of patients and for the ambulances.

"In trench warfare and in some quiet sectors the field hospital was of semi-permanent character and was often elaborately installed with modern equipment and conveniences in well-adapted, commodious buildings or well-arranged dugouts. The equipment, in addition to all surgical essentials, included electric lights, portable radiographic and laboratory units, steam sterilizer, and other similar conveniences. In a few instances they, complete with equipment, were taken over by the French. Usually, under these conditions, one field hospital functioned as triage and cared for the wounded and gassed, one cared for the sick, one for skin and venereal cases, and a fourth was held in reserve, frequently conducting a convalescent camp for transportable patients and supplementing the others as required. All cases likely to become fit for duty in from ten to fourteen

days were held. While no definitive measures were undertaken, greater latitude and freedom of action within the discretion of the staff was customary than usually proved possible in open warfare.

"The normal personnel of the field hospitals usually was augmented by the division specialists of the various branches and at times also by special operating rooms and shock teams. In a few instances, their facilities for the care of non-transportable wounded were increased by the attaching of mobile surgical units.

"It was not intended that definitive surgery should be performed in field hospitals except upon certain non-transportable patients, as evacuation hospitals were provided for this purpose. The scope of professional activities in field hospitals varied greatly according to the intensity of the action, but during an offensive it was customary to evacuate all patients as soon as they could endure transportation."

1918-1931. GENERAL IRELAND'S ADMINISTRATION AFTER THE WORLD WAR PERIOD

1918

November. Demobilization and reorganization of the Regular Army was the problem of the hour, returning and restoring men to their occupations in the homeland. The Army consisted of over 3,500,000 men; the Medical Department had over 350,000 officers and men. There were still approximately 265,000 sick and wounded remaining in hospitals in France and the United States. The Medical Department continued to restore the disabled and sick soldiers to the best possible health. Physical examinations were conducted on all soldiers prior to their discharge in order to make records of their physical condition and to list their disabilities if any were noted.

1919

May. The "Medical Research Laboratory and School for Flight Surgeons" was established at Hazelhurst Field, Long Island, New York, and the first course of eight weeks was started.

June. A serious outbreak of typhus fever in Serbia led to the dispatch of a commission by the American Red Cross to fight the disease. Lieutenant Colonel Edgar Erskine Hume, M.C., United States Army, was appointed Chief Medical Officer and American Red Cross Commissioner. The work was completed successfully, and the Commission withdrew during the summer and early fall of 1920.

July 1. The Medical Department had gradually been reduced by demobilization to 12,731 officers, including the Medical Reserve Corps still on active duty, and 83,577 enlisted men. Approximately 18,000 officers and 195,000 enlisted men of the Medical Department had been discharged since Armistice Day.

July. The responsibility of caring for the war veterans was turned over to the United States Public Health Service. Several large Army hospitals used during the war were also transferred to the Public Health Service to increase their facilities for this added duty.

August. The "Medical Research Laboratory and School for Flight Surgeons" was moved to Mitchell Field, Long Island, New York, and the course extended to 4 months.

September 1. The Office of the Chief Surgeon of the American Expeditionary Force was concerned only with the personnel of the American Forces remaining in Germany.

December. The Chief Surgeon's Office of the American Expeditionary Force organized the Polish Typhus Relief Expedition consisting of Medical Department personnel of the Regular Army. This expedition was later placed under the control of the Army of Occupation in Germany.

Miss Julia Stimson was appointed Superintendent of the Army Nurse Corps in recognition of her excellent war service. She had been chosen by the Chief Surgeon of the American Expeditionary Force to be Chief Nurse of the Red Cross Nurses in France in March, 1918, which position she held until November of the same year. Then she was appointed Director of Nursing Service of the American Expeditionary Force. She returned to the United States in July, 1919, and served as Dean of the Army School of Nursing until her appointment as Superintendent of the Army Nurse Corps. She succeeded Miss Dora

E. Thompson, who voluntarily resigned as Superintendent. Miss Thompson, after return from an extended leave, was appointed Assistant Superintendent of the Army Nurse Corps.

1920

January and February. There was a mild epidemic form of influenza, which increased considerably the soldier death-rate for 1920. However, it was not as severe as the form of influenza during the World War which so frequently led to complications of pneumonia.

May 15. The Secretary of War authorized the use of the Carlisle Barracks Military Reservation for the purpose of establishing a Medical Field Service School. The Barracks, previously occupied by the Indian Industrial School, had been used by the War Department during 1918 as General Hospital No. 31. April 28, 1920, General Merritte W. Ireland, then Surgeon General, wrote to the Adjutant General requesting that the reservation be permanently assigned to the Medical Department for a service school for field training of its officers and enlisted personnel. The letter of approval from The Adjutant General's Office was dated May 15, 1920.

June 4. The amendments to the National Defense Act provided the Medical Administrative Corps as a part of the Medical Department to furnish an auxiliary service to the professional corps. The organization was fixed at 140 officers and the Corps was established by giving permanent commissions to enlisted men who had been commissioned in the Sanitary Corps during the World War.

Nurses of the Army Nurse Corps received relative rank and were authorized to wear insignia on their uniforms. They were given the rights and privileges of their respective rank as officers. The Superintendent of the Army Nurse Corps, Miss Julia Stimson, received the rank of major.

June 30. Over 5,500 military patients of the United States Army whose disabilities were caused by battle wounds were still remaining in hospitals of the United States.

July. The Medical Department officer personnel was further reduced to: Medical Corps, 1,948; Dental Corps, 322; Veterinary Corps, 283; and the Nurse Corps to about 1,500.

October 1. The Medical Department Equipment Laboratory was established at Carlisle Barracks, Pennsylvania, to provide an experimental laboratory for producing, testing, and determining the serviceability of medical equipment, especially the equipment used in medical field service.

During 1920. Graduates of Class A medical schools were accepted as internes in the larger station hospitals and the general hospitals of the Army. After completing an internship of one year many were offered commissions as first lieutenants in the Medical Corps.

1921

The Medical Field Service School was established at Carlisle Barracks, Pennsylvania, for the purpose of training Medical Department officers in medico-military matters to include tactics, field sanitation, administration, organization of medical units for field service, equitation, motor mechanics, and allied subjects. On May 25 of the same year The Adjutant General approved the present coat of arms for the Medical Field Service School with the motto "To conserve fighting strength". (For further information relative to this school see Chapter II.)

February. The Medical Research Laboratory and School for Flight Surgeons was listed by the War Department as a "service school".

August. The "Veterans' Bureau" was created by Congress and became responsible for the care and treatment of the War Veterans. This duty had originally been handled by the Medical Department of the Army until July, 1920, when it was relinquished to the United States Public Health Service.

1922

Upon recommendation of Major General Merritte Weber Ireland, the Surgeon General, a third "Tropical Disease Board" was established in Manila, (W. D. Special Orders No. 38-0, February 19, 1922, and No. 85-0, April 12, 1922) where it functioned until Major General Robert Urie Patterson recommended its transfer to the Panama

Canal Department in 1934. The third Tropical Disease Board included in its membership medical, veterinary, and medical administrative corps officers. Hookworm, leprosy, tuberculosis, dengue, veterinary bacteriology, beriberi, cancer, surra, and rinderpest were among the subjects investigated in the Philippine Islands.

A general remodeling and modernizing of all field medical equipment was begun. The demobilization of the World War was nearing completion, and the lessons learned in that war were being given consideration and thought.

The need for a professional training school for Army dental officers had become evident and the Army Dental School came into existence at the Army Medical Center, Washington, D. C.

The personnel strength of the Medical Department was now as follows: Medical Corps, 983; Dental Corps, 128; Veterinary Corps, 126; Medical Administrative Corps, 72; Nurse Corps, 669; and enlisted men, 7,200.

Army Regulation 350-105 changed the name of the School for Flight Surgeons to "The School of Aviation Medicine."

1923

The regular monthly medical meetings which are held at the Army Medical Center were initiated. These meetings foster a closer relationship socially and professionally between Medical Department officers. In addition, they extend this relationship to corresponding medical officers and officials of other governmental agencies and civilian doctors practicing in the vicinity of Washington, D. C. Officers of the Medical Department Reserve Corps are also invited to attend. These meetings are held at eight o'clock at the Auditorium (center wing of the School Building), Army Medical Center, on the third Monday evening of each month, from October to May inclusive. The professional address and discussion is followed by a social hour during which refreshments are served.

The School Building of the Army Medical Center was built near Walter Reed General Hospital, Washington, D. C. The War Department issued orders directing that the Takoma Park section of the District of Columbia be known as "The Army Medical Center," Washington, D. C.

1924

The Medical Department Reserves had grown steadily and attained the following strength: Medical Corps, 7,559; Dental Corps, 3,055; Veterinary Corps, 865; Sanitary Corps, 416; Medical Administrative Corps, 880; and the Red Cross (Nurse Reserve), 40,636.

1926

June 30. The School of Aviation Medicine was moved from Mitchel Field, Long Island, New York, to Brooks Field, Texas.

1927

The *Index Medicus* of the Army Medical Library and the *Quarterly Cumulative Index of the American Medical Association* were combined and published jointly.

1928

Domestic cattle in the Philippines were vaccinated against rinderpest, eliminating in large measure this disease of animals in the Islands. The rinderpest vaccine used was prepared by Major Raymond A. Kelser of the Veterinary Corps, Regular Army. This immunization measure has been of tremendous value to economics of the Philippine Islands and adjacent countries.

The Reserve Corps of the Medical Department had continued to grow, and the number in each corps at this time was: Medical Corps, 12,113; Dental Corps, 4,706; Veterinary Corps, 1,061; Sanitary Corps, 497; Medical Administrative Corps, 1,889; Nurse Corps, 47,252. Many non-divisional reserve units of the Medical Department had been organized to which Reserve officers were assigned. Eight Regular Army Medical Department officers were assigned to full time duty in connection with industrial preparedness through procurement planning. Also, Reserve officers who were engaged closely with production of Medical Department supplies had been given tours of active duty in the Surgeon General's Office in order that procurement planning might be carried out more wisely.

1929

A medical officer, Colonel Harry L. Gilchrist, Medical Corps, was appointed Chief of the Chemical Warfare Service with rank of major general.

At the request of Major General Ireland, Surgeon General of the Army, Colonel P. M. Ashburn, Medical Corps, wrote and published *A History of the Medical Department of the United States Army* which was dedicated to the Unknown Soldiers of the Medical Department. This book covers in detail the growth and history of the Medical Department, the biographies of important Medical Department officers, and the activities and achievements of the Medical Department and its members. It is a book which every Regular and Reserve officer of the Medical Department should own and read.

In May of the same year, Lieutenant Colonel Edward B. Vedder, Medical Corps, published his book *Medicine, Its Contribution to Civilization*. Colonel Vedder had worked on the study of beri-beri while a member of the Tropical Board in the Philippines and had written an excellent book on the subject in 1913. He was also one of the first physicians to advocate the use of emetine in the treatment of amoebic dysentery.

1930

Lieutenant Colonel George C. Dunham, Medical Corps, published the first edition of *Military Preventive Medicine* (Army Medical Bulletin No. 23), a comprehensive text of basic information necessary to the practice of preventive medicine in the Army. The third edition was completed June 30, 1938. This excellent book is used as a text in the Department of Sanitation for the students who attend the Medical Field Service School at Carlisle Barracks, Pennsylvania. Its usefulness is not limited to the Army but is a ready reference in public health measures pertaining to civilian communities.

1931

An order of the Secretary of War directed the discontinuance of the Army School of Nursing, Washington, D. C. Its true professional value had been revealed by the excellent qualities of its graduates, but the school was closed for reasons of economy as graduates from civilian hospitals could readily be secured for commissions in the Army Nurse Corps.

October 30. The School of Aviation Medicine was moved from Brooks Field to Randolph Field, Texas, its present location.

December. The publication of the *Index Medicus*, originated by the Army Medical Library during Surgeon General William A. Hammond's administration, became a function of the *Journal of the American Medical Association*.

Other Events during the Period 1918-1931

Surgeon General Ireland made many progressive changes and additions to the Medical Department during his administration. He had a thorough knowledge of the needs of the Medical Department and its relationship to the rest of the Army. During the World War his leadership was in a large way responsible for the success and harmony between the combat forces and the medical service.

One of the largest of Surgeon General Ireland's advancements for the Army was the organization of the Army Medical Center, Takoma Park, Washington, D. C., where is located the Walter Reed General Hospital, The Army Medical School, The Dental School, The Veterinary School, and the technical training schools for enlisted men of the Medical Department.

The Medical Department passed through a stabilizing period following the World War; the knowledge which had been acquired shaped the development of future policies and organization of the Medical Department.

1932-1942. THE PERIOD FROM GENERAL IRELAND'S ADMINISTRATION TO 1942

1932

The Army Medical School was enlarged to provide additional facilities.

January 14. The Book Shop at the Medical Field Service School was opened for the benefit of officers of the Medical Department. This institution provided a place where

they could secure all materials necessary for instructional purposes in medico-military training.

1933

March. Complete medical service was instituted for the Civilian Conservation Corps. Reserve officers of the Medical Department were ordered to active duty and utilized as much as possible, relieving Regular Army Medical Department officers who had initiated this work. This medical service for the Civilian Conservation Corps is still conducted by the Medical Department of the Army.

July 1. The School of Aviation Medicine, Randolph Field, Texas, was closed until December 31 because of Civilian Conservation Corps activities.

The Medical Department was authorized to employ civilian nurses for the Civilian Conservation Corps at the rate of one nurse per each ten patients.

The increased activity of the Army in caring for the Civilian Conservation Corps required similar changes in the Medical Department, with expansion of the peace time hospital facilities. The medical supplies which were left over from the World War were utilized for the initial period of enrollment and establishment of camp dispensaries. The knowledge of field sanitation was put into practice immediately and proved its value many times.

1934

A post graduate course at the Army Medical School was initiated for Medical Department officers of higher grades as a professional refresher course.

January 2. The School of Aviation Medicine, Randolph Field, Texas, was reopened. Two courses for medical officers have been conducted each year.

April 19. In compliance with the recommendation of Major General Robert Urie Patterson, the Surgeon General, the Secretary of War ordered the transfer of the Third Tropical Disease Board from the Philippine Islands to the Board of Health laboratory, Gorgas Hospital, Ancon, Canal Zone. It was established there on July 26, 1934 and functioned until it was dissolved in 1939 upon the recommendation of Major General James Carre Magee. In Panama the Board's studies included malaria, dysentery, degenerative arthritis in horses and mules, and equine encephalomyelitis.

April 26. The Medical Department Reserve Officers' Training Corps enrollment was discontinued. The Medical Reserve Corps appointments were given to graduates of approved medical schools who were licensed and engaged in practice, upon recommendation of an examining board.

1935

January 30. The Veterinary Corps was reorganized with grades and promotion of officers from appointment to retirement made similar to appointment and retirement of the Dental and Medical Corps. All second lieutenants of the Veterinary Corps were promoted to first lieutenant at once.

1936

The average strength of the Medical Department was reported as: Medical Corps, 1,033; Dental Corps, 183; Veterinary Corps, 126; Medical Administrative Corps, 72; Nurses Corps, 625; and enlisted men, 8,377. Appropriation Acts provided an increase of 50 medical officers and 25 dental officers for each of the next three years, 1936, 1937, and 1938.

January 13. The Surgeon General's Office was reorganized into 10 divisions and 30 subdivisions. (See Surgeon General's Office).

February. The *Medical Instructors Bulletin* was authorized by the War Department to be issued by the Surgeon General to corps area and department surgeons and medical instructors of the National Guard and Organized Reserves. This bulletin contained information of special interest to medical instructors dealing with the problems of the National Guard and the Organized Reserves.

May 15. The Medical Reserve Officers' Training Corps was reestablished and, in the fall of the same year, instruction was started in several medical schools.

June 4. An Act of Congress provided changes in the requirements for appointment of Medical Administrative Corps officers. It limited appointments to graduates of a four year course in recognized schools of Pharmacy, thereby excluding the commissioning of former Medical Department enlisted men unless they possessed the above requirements.

November 16. The celebration of the 100th Anniversary of the founding of the Army Medical Library was commemorated in Washington, D. C. Approximately 600 guests were present, many of whom were world famous doctors, scientists, librarians, and representatives from medical institutions and societies from all parts of the United States and foreign countries. The chief oration was made by Sir Humphry Davy Rolleston, Baronet, G.C.V.O., K.C.B., M.D., Emeritus Regius Professor of Physic (Medicine), University of Cambridge, England. The library contained more than a million items and was then and still is the largest medical library in the world.

1937

January. A physiological research laboratory was completed at Wright Field, Dayton, Ohio. It was designed for research work in aviation medicine.

July. The *Medical Instructors Bulletin*, previously issued quarterly, was discontinued as a separate publication, and the information contained therein was placed in the *Army Medical Bulletin*. The latter, containing administrative and professional information of interest to all members of the Medical Department, is issued quarterly to each Regular Army officer of the Medical Department. This bulletin is edited by the executive officer of the Surgeon General's Office and printed at the Army Printing Plant, Carlisle Barracks, Pennsylvania.

September 9. Internships in Army hospitals were discontinued. Commissioned officers of the Medical Corps, Regular Army, were appointed by competitive examination. A physical examination was required before the candidate was permitted to take the professional examination. This method of appointment is still used.

December. Type I and Type II pneumonia immunization, following experimentation for one year prior to this time, was extended to the Civilian Conservation Corps in all corps areas using the vaccine prepared at the Army Medical School. The results proved very favorable.

During the year. Over 500,000 doses of typhoid prophylactic were made available to the Red Cross in the flood relief of the Ohio Valley.

The 1st Medical Regiment, Carlisle Barracks, Pennsylvania, assisted in relief work during the flood of the Ohio River Valley. The regiment arrived near Louisville, Kentucky, about January 30, and set up and directed medical care in several centers.

1938

Appropriation for the fiscal year 1939 authorized an average strength of 165,000 enlisted men and 14,659 officers for the Regular Army. The Medical Department strength was: Medical Corps, 1,183; Dental Corps, 258; Veterinary Corps, 126; Medical Administrative Corps, 63; Nurse Corps, 675; and enlisted men, 8,643. There were also 740 civilian employees in the Surgeon General's Office. An addition of two assistants to the Surgeon General in the grade of brigadier general was authorized.

The first brigadier general of the Dental Corps was appointed as Assistant to the Surgeon General, Chief of the Dental Division. Lt. Colonel Leigh C. Fairbank, Dental Corps, was appointed and assumed office March 17, 1938.

March 16. Central dental laboratories were established to serve groups of station hospitals with the exception of those station hospitals having their own dental laboratory service or those served by a general hospital laboratory.

April. A report was made which indicated that prior to this time there were 36 graduates of the Command and General Staff School, 30 graduates of the Army War College, 8 graduates of the Infantry School, and 31 graduates of the Army Industrial College in the Medical Department.

June. The daily mean strength of the Civilian Conservation Corps was 244,342. Therefore, in reality, the Medical Department was caring for the Regular Army plus the

Civilian Conservation Corps, a total of approximately 500,000. Since the enrollment periods are six months, many physical examinations for entrance and discharge from the Civilian Conservation Corps are conducted at these periodic intervals. Although the Civilian Conservation Corps was introduced on a temporary basis, it is now being considered for permanent establishment.

June 15. The President approved a bill passed by the Congress authorizing \$3,750,000 for the future construction of a building to replace the present Army Medical Library and Museum. However, funds were not appropriated for this construction in 1938.

June 29-July 6. About 1,900 Civil War veterans of the North and the South joined in a reunion at Gettysburg, Pennsylvania to celebrate the 75th anniversary of the Battle of Gettysburg, which was fought July 1, 2, and 3, 1863. The Surgeon General was in complete charge of all medical activities and responsible only to the Federal Commission. The Surgeon General utilized the 1st Medical Regiment, Carlisle Barracks, Pennsylvania, to carry out his medical plan. Including visitors the strength of the command reached a maximum of 209,319. There were 2,693 outpatient treatments, 83 admissions to hospitals, and 7 deaths. Only 2 deaths occurred at Gettysburg, the other 5 deaths occurring en route to or from the reunion of the Blue and the Gray. Lieutenant Colonel Paul R. Hawley, 1st Medical Regiment, was the Surgeon, Blue and Gray Reunion, and the representative of the Surgeon General. The civilian hospitals in nearby cities were used when necessary. Little difficulty was experienced in handling the veterans, who averaged the age of 94.

During the year. Research on the medical aspects of chemical warfare was carried on at Edgewood Arsenal, New Jersey.

1939

May. The George S. Huntington anatomic collection was presented to the Medical Department of the Army by the Columbia University Medical School. It is the most comprehensive and one of the most valuable collections of comparative and human anatomic specimens in the world, illustrating most structures of the body. The delivery of this collection to the Army Medical Museum was completed during May, 1939.

May 7-May 15. The Tenth International Congress of Military Medicine and Pharmacy met in Washington, D. C. Major General Charles R. Reynolds, Surgeon General of the United States Army, was President of the Congress and Chairman of the organizing committee. It was the first meeting of this medico-military congress in the western hemisphere.

July 15. President Roosevelt signed a bill authorizing the construction of a new building for the Medical Field Service School at Carlisle Barracks, Pennsylvania.

October. The Surgeon General announced that prospective dental officers might apply for training as internes in Army hospitals. This enables the Medical Department to complete the training of Dental Corps candidates under its own supervision.

December. As a part of the program initiated by the declaration of the President of a state of "limited emergency," the courses at the Army Medical School and Medical Field Service School were materially rearranged. The class at the Army Medical School was graduated December 1. Two Basic classes, for a period of three months each, were provided at the Medical Field Service School instead of one, the first to start December 4, 1939, the second March 11, 1940.

During the year. Authority was granted by the Congress to increase the medical officers of the Regular Army from 1133, as of July 31, 1939, to 1492 by June 30, 1949, this increase to be attained by equal, annual increments. During the fiscal year 1940, the Medical Corps was to be increased by 77 officers.

Because of the prevalent epidemics of equine encephalomyelitis in the United States during 1939, the Army Veterinary School completed the manufacture and distribution of sufficient encephalomyelitis vaccine for the immunization of all horses and mules of the Regular Army, National Guard, and R. O. T. C. units, and the vaccination of approximately 35,000 animals.

1940

January 15. A Medical Department Research Coordinating Board was appointed by Major General James Carre Magee, the Surgeon General, to investigate and report upon the various diseases or conditions directly affecting the military personnel and Army animals. The members included the chiefs of the Professional Service Division, Statistics Division, Finance and Supply Division, and Veterinary Division of the Surgeon General's Office; Chief of the Division of Aviation Medicine in the Office of the Chief of the Air Corps; the Assistant Commandant of the Medical Department Professional Service Schools, Army Medical Center; Director of Laboratories, Medical Department Professional Service School; Director of the Dental School; Chief of the Medical Research Division, Edgewood Arsenal, Maryland; and the Secretary of the Medical Department Professional Service School, Recorder.

June 30. The personnel strength of the Medical Department Reserve Corps was approximately as follows: Medical Corps, 16,000; Dental Corps, 5000; Veterinary Corps, 1500; Sanitary Corps, 500; and the Medical Administrative Corps, 1200. The total strength of the Medical Department Reserve Corps was about 24,000.

July 15. Starting with the course of instruction beginning July 15, 1940, graduates of the School of Aviation Medicine were classified as "Aviation Medical Examiners." When a graduate has served a minimum of one year of active duty with the Air Corps, after having received such a qualification, and has demonstrated that he possesses the required qualifications, he may, under such regulations as the Surgeon General prescribes, be rated as "Flight Surgeon."

September 9. Construction began on the new school building (Hoff Hall) for the Medical Field Service School at Carlisle Barracks, Pennsylvania.

During the year. Changes in Army Regulations were made to classify noncommissioned officers of the Medical Department in all grades within two categories: the *tactical group* and the *hospitalization and administration group*. The tactical group includes personnel with medical regiments, medical battalions, medical squadrons, medical or veterinary troops, separate companies, medical or veterinary, and unit medical detachments. The hospitalization and administration group includes all other non-commissioned officers of the Medical Department.

1941

February 12. Regulations were issued to provide for vaccination against yellow fever for all United States military personnel stationed in the tropical regions of the Western Hemisphere, including Panama and Puerto Rico.

April 16. War Department S. G. O. Circular No. 34 directed that tetanus toxoid be administered to all military personnel on active duty. Subsequent vaccination with tetanus toxoid (a single "stimulating" dose of 1 c.c.) will be administered at the end of the first year only, regardless of duration of service. In time of war a "stimulating" dose will be given during the month prior to departure for a theatre of operations. Record of the immunization will be placed on the individual's identification tag and on an Immunization Register, M.D. Form No. 81.

July. The initial Medical Administrative Officer Candidate School was started at Carlisle Barracks, Pa.

August. Completely mobile, surgical, field hospital units with self-contained operating facilities permanently installed in motor vehicles were authorized for purchase by the War Department.

A new department, "Department of Medicine and Surgery in Forward Areas," was established at the Medical Field Service School, Carlisle Barracks, Pennsylvania, to collect, classify, evaluate, and disseminate information relative to new methods of treatment for wounded on battlefields. It will also study the progress of industrial medicine as adapted to military practice.

October. The new building (Hoff Hall) for the Medical Field Service School at Carlisle Barracks, Pennsylvania, was completed.

December 7. The Japanese Navy attacked Pearl Harbor, Hawaii, thereby declaring war on the United States. The strength of the Army of the United States was 1,700,000.

During the year. The routine annual physical examination of officers of the Regular Army was suspended during the "National Emergency" for officers below the grade of lieutenant colonel.

Professional examination for promotion in the Regular Army of officers of the Medical, Dental, and Veterinary Corps was discontinued by law until May 15, 1945. Physical examination for promotion was not discontinued.

Three medical replacement training centers were constructed and activated. They were located at Camp Grant, Illinois; Camp Lee, Virginia; and Camp Barkeley, Texas. Upon completion of the 13-week training period, as outlined by Mobilization Training Program 8-5, at these replacement training centers, the trainees are requisitioned and transferred to Medical Department units, where they continue their training as pertains to the unit to which they may be assigned (unit training).

The War Department established eighteen branches of the School of Aviation Medicine at various Air Corps stations in the United States, the Panama Canal Zone, and Hawaii.

Julia O. Flikke, Major in the Army Nurse Corps, was promoted to the grade of Colonel, the first Army Nurse to attain this rank.

1942

A new medical replacement training center was established at Camp Joseph T. Robinson, Arkansas, bringing the total of medical replacement training centers to four. The Replacement Training Center at Camp Lee, Virginia, was moved to Camp Pickett, Virginia.

March. There was a reorganization of the War Department into three main components: the Army Ground Forces, the Army Air Forces, and the Services of Supply. The Medical Department was placed within the Services of Supply.

April 11. The second Medical Administrative Officer Candidates' School composed of an initial group of 250 candidates was started at the Medical Replacement Training Center, Camp Barkeley, Texas. This capacity was increased progressively.

During the year. In order to provide for the prevention of disease in the Army during the present emergency the following subdivisions of the Surgeon General's Office were made: Epidemiology, disease control and individual hygiene; Sanitation, hygiene, and laboratories; Sanitary engineering; Venereal disease control; and Medical intelligence in tropical medicine.

WITH DUE RESPECTS TO ARMY MEDICINE

The Army medical officer is frequently confronted with the following or similar questions from his friends and civilian colleagues: "What medicine and surgery do you practice in the Army?"; or "What does the doctor in the Army accomplish as an individual?" The questions are often vague because so few people know what the Army medical officer does and the scope of his activities. Neither do they know his responsibilities nor the true mission of the Army Medical Department of which he is a member. Therefore in a brief resume of achievements of the Medical Department of the United States Army and its officers this chapter may help the reader to understand the true value of Army medicine.

Army medicine in the United States began with the Revolutionary period when Dr. Joseph Warren, a major general of militia, and several other medical men fought in the line during the Battle of Bunker Hill. When the battle was over the wounded were placed in several large commodious homes which were used as hospitals. These doctors devoted their service in whatever capacity they thought most necessary for their cause of liberty. If the superiority of fire was deemed most urgent they placed themselves firing a weapon in the line, and when the firing ceased they returned to their medical work, caring for the sick and wounded.

This same spirit prevails in the Medical Department of the United States Army today. Its officers are still giving their time and efforts to preserve the fighting strength of our Army.

As the result of improved medical care and sanitation the health of America is constantly

improving. The result of this progress is already manifest in the Army during the present emergency. All troops destined for foreign shores have been given special immunization against diseases which they might encounter. The Army was one of the first organizations to put many of these modern health measures into practice with demonstrable success. A few examples of these methods are: regular physical examination of the personnel of the Army; routine immunization against typhoid, small-pox, diphtheria, tetanus, and yellow fever; and the control of venereal disease. The early discoveries, the application of practical sanitary measures, and the medical practices of the Army have not only prolonged the life of its own personnel but that of all people of the civilized world.

An Army Doctor Purifies Water

It was a medical officer of the United States Army who originated and devised a method of purifying water by means of chlorine. He discovered that the amount of chlorine required to kill the pathogenic organisms in water did not render it unpalatable for drinking. Later, in 1910, he added to his discovery by developing a mechanical *liquid chlorine water purifier* which is now used throughout the world. Major C. R. Darnall, Medical Corps, is responsible for these feats, which have not been generally known to the public. Water can be purified in large quantities by this method, and large cities now are almost entirely dependent upon it since their original sources of water supply are unfit for human consumption. Purifying water, a source of many diseases, has done more to save human lives than any other preventive health measure.

The Army Conquers Yellow Fever

It was an Army doctor, assisted by members of his medical board, who made the outstanding investigation about *yellow fever*, proving this particular disease to be transmitted by the mosquito. Then the Army immediately went to work utilizing this information for the benefit of all mankind. Major Walter Reed, Medical Corps, was provided with the support of the Army in making this discovery possible. At that time Major General Leonard Wood, who was formerly a Medical Corps officer, was the Chief of Staff of the United States Army. Because of his medical knowledge and loyalty to the medical profession, he insured the cooperation of the Army in supporting the investigation, furnishing necessary personnel and materials to carry out the proposed sanitary measures. Yellow fever had ravaged Cuba for over 150 years and had puzzled many expert authorities; therefore, the United States Army can rightly take pride in this achievement.

The method of transmission of yellow fever having been determined, the Army quickly put on an active campaign against the guilty mosquito. In less than two years, under the supervision of Major William Gorgas, Medical Corps, Cuba became a tropical paradise, without yellow fever except those cases which came from outside sources. Since 1941 all military personnel have been inoculated against yellow fever. This is a large biological experiment testing the usage of prophylaxis against yellow fever for an army of several millions. Many of the troops inoculated are expected to serve in regions where yellow fever is still prevalent.

The Army Builds the Panama Canal

Four years later, in 1907, when the United States was determined to build the canal across the Isthmus of Panama, the Army Medical Department was given the mission of controlling the yellow fever that had defeated the French in their attempt to build the Panama Canal. Colonel Gorgas was appointed Chief Sanitary Officer. He continued the same fight against mosquitoes in Panama that he had used successfully in Cuba. Yellow fever was eradicated in Panama, permitting the Engineer Corps of the United States Army to accomplish an engineering feat at which other countries had failed. The clearing of the jungles of Cuba and Panama brought not only a great economic result, but awakened the knowledge of the control of disease. Many cities in the tropics began to rise out of their diseased darkness and became prosperous, their populations healthy, and their locations attractive.

Therefore, thanks to the Medical Department of the United States Army, yellow fever

no longer is a dreaded fear to the medical profession. Within the United States no case of yellow fever has originated for thirty years. In 1937 the reported prevalence of yellow fever was confined to Africa and South America. The benefits which have come to our civilization cannot be given a monetary value, but certainly the Army deserves unrestricted credit for the elimination of this disease.

The Army Investigates Typhoid

During the Spanish-American War in 1898, the Medical Department was confronted with the dreaded *typhoid fever*. Out of every 100,000 soldiers, 14,000 were admitted to sick report with this disease. About 3,450 men died of diseases during this war, due mainly to the epidemics of typhoid among troops at camps.

The "Reed-Vaughn-Shakespeare Typhoid Board" composed of medical officers was appointed to make a study of the disease in the camps. The report of these Army officers on typhoid shed much of our present light on the disease. The one important factor missed was the detection of human carriers and their relation to the dissemination of typhoid. In the opinion of the medical profession of that period typhoid was generally considered a water-borne disease. The board's study disclosed many of the weak spots in sanitary measures and the agents by which typhoid is transmitted. Following the Spanish-American War, during which typhoid was so prevalent, a steady improvement was brought about by the general observance of sanitary measures. It was learned that it could be transmitted by means of direct contact, flies, milk, and water. Although prophylactic immunization was not known, the improvement in sanitation cut the admission rate for typhoid in the Army from 85.46 cases per 1,000 strength per annum in 1898 to 3 per 1,000 strength per annum in 1908.

In 1908 the Army sent Major F. F. Russell, Medical Corps, to Europe to study the epidemiology of typhoid fever in foreign armies. He submitted a valuable treatise from his study, whereupon the Army appointed a board to consider the use of vaccination for protecting the troops against typhoid fever. Voluntary prophylaxis was started in the Army in 1909 and made compulsory in 1911. The Army thereby introduced typhoid immunization into this country and initiated immunization on a large scale.

Now compare the results with those of the World War, since the Army had the necessary materials and facilities to carry out their studies and plans. It will be recalled that in the Spanish-American War that out of every 100,000 soldiers, 14,000 were afflicted with typhoid fever. In the World War this ratio was reduced to 37 cases of typhoid per every 100,000, a striking result of controlled, preventive medicine. Approximately 1,500 cases of typhoid occurred during the World War, whereas, in comparison to the Spanish-American War rate, there would have been 500,000 cases. The lesson from this evidence not only convinced the Army of the value of typhoid prophylaxis, but the entire medical profession accepted it sincerely; today anti-typhoid inoculation is a generalized and accepted practice. Army statistics report but four cases of typhoid in the Army in 1938, all of which were in the Philippines.

The Army has another conclusive record of the control of typhoid fever in the Civilian Conservation Corps, which has an average of 300,000 young men of typhoid age. The cumulative case rate per 1,000 strength per annum for the Civilian Conservation Corps since 1933 averages less than .25 cases per 1,000 strength per year. In 1936 the rate was .08 per 1,000 strength, a remarkably low figure, which illustrates the result of a controlled Army prophylaxis against typhoid when administered to a civilian body of men. The Army is a large contributor to the history and confirmation of typhoid inoculation. For 1936 and 1937 the typhoid and paratyphoid case rate in the United States was 12.4 cases per 100,000 population. The typhoid death rate per 100,000 population in the United States for 1935, 1936, and 1937 was 2.4. There were but 2 deaths from typhoid in the Army during 1940. During the present emergency there has been no serious outbreak of typhoid fever.

The Army Makes and Distributes Vaccine

In addition to the administration of typhoid prophylaxis in the form of inoculations and sanitary measures, the Army produces a vast amount of typhoid vaccine in its laboratories.

During national emergencies, such as the Ohio Flood Relief in 1937, over 500,000 doses of prophylactic vaccine were distributed to civilians. Besides furnishing this vaccine, the Army also placed its personnel, equipment, and transportation as needed to facilitate the service of relief. The former experience of the Army which occurred in the camps of the Spanish-American War was averted, and the fear of a typhoid epidemic checked before it started. The Army acts with sensible preparedness.

The Army Medical Department distributes vaccine to many agencies besides the Army itself. Its yearly distribution of typhoid vaccine is over 2,000,000 cubic centimeters, 500,000 cubic centimeters of which are held in reserve above routine requirements in anticipation of national emergencies. Other governmental agencies such as the Navy, Marine Corps, Civilian Conservation Corps, National Guard, Reserve Officers' Training Corps, and Citizens' Military Training Camps secure their vaccine from the Army Medical School. In terms of immunizing courses (consisting of three doses) since 1929, over 8,000,000 courses (approximately 15,000,000 cubic centimeters) of typhoid vaccine have been distributed by the Army Medical Department.

The increased production of vaccine during the past few years has been due to the greater strength of the Army, Navy, and the Civilian Conservation Corps. The Army is still pushing forward in this great work of defense against the typhoid bacillus, with results already obtained deserving commendation. The capacity of production in the Army laboratories at present is so organized that over 1,500,000 doses can be made in one week.

The argument is often made that the lowering of the typhoid rate in the Army was just coincidental with that of the general population and due to the improvement of community sanitation. It is undoubtedly true that these factors have lowered the civilian rate for typhoid fever, and to some extent the army rate, but a comparison of the Army rate after compulsory inoculation in 1911 with the civilian typhoid rate in registration areas indicates a far greater reduction of typhoid in the Army. The Army accomplished more in five years than the United States as a whole accomplished in almost thirty years. The Army mortality rate for typhoid fever had been reduced to 3.24 cases per 100,000 by 1915, and this ratio was not accomplished by the civilian population until after 1935. Could the civilian population be subjected to the preventive control of typhoid as practiced in the Army, their rate would soon be reduced to a more favorable proximity of zero.

The Army Pioneers American Bacteriology

The discovery of germs, and the fact that they cause disease, rationalized the practice of medicine and opened the field of preventive medicine and public health. *Bacteriology* became a science of paramount importance. The Army Medical Department in 1893, administered by Surgeon General George M. Sternberg, a pioneer bacteriologist, was in the front line. The department was quick to advance the knowledge and study of preventive medicine. Laboratories were established in all station hospitals during General Sternberg's administration, and he founded the Army Medical School. Since that time the Army has continued to do pioneer work in the field of preventive medicine. Its success in research work is due to the well trained personnel who are permitted to engage uninterruptedly in their investigations. Another fact is that the Army has large groups of men under military control, which facilitates investigation and permits follow-up of results and corrections. When war comes, the clinical field is enlarged with much the same control under full government authority. Consequently the Army Medical Department has been able to make many advances in medicine that have been of outstanding service to humanity.

Surgeon General Sternberg made many researches on pneumonia, malaria, yellow fever, and serum therapy. The Army is still persevering in those same researches step by step, adding daily to the value of bacteriology in medicine. Several agencies of the Medical Department are now engaged in study and research work. A Medical Department Research Coordinating Board was appointed January 15, 1940, to facilitate research problems in the Army. During the present emergency the services of eminent men of the medical profession are being utilized by the Army in order to control diseases caused by bacteria.

The Army Studies Pneumonia Prevention

General Sternberg's early study of pneumonia is today being enhanced on a large scale, especially the preventive and protective measures against it. Since 1933 the Army has been producing and distributing pneumococcus vaccine to governmental agencies, and in addition is conducting an experimental measure against pneumonia in the Civilian Conservation Corps. Favorable reports have been made, and the experiment is being continued. In the inoculated groups during 1933 to 1937 the case rate for lobar pneumonia was 79.5 per 100,000 enrollees, and the rate in the uninoculated (control) group was 225.9. During the year 1938 over 271,000 doses of pneumococcus vaccine were supplied to the Civilian Conservation Corps agencies, and a reserve stock of 450,000 was prepared in anticipation of its extended use in the Regular Army. The modern army is not different from that of the period of General Sternberg. It is digging deep into the wells of knowledge uncovered by the science of bacteriology. The Army realizes the high mortality and incidence of pneumonia and the need of specific preventive measures against it.

The Army Lowers Its Venereal Rate

Recently the public has been able to secure more information and become vitally conscious of the prevalence of venereal disease. The military departments of our government were early promoters of *venereal disease control*. During the Civil War, the venereal rate was 215 cases per 1,000 soldiers in service; during the Spanish-American War there was only a slight improvement. As late as 1909, prior to the institution of voluntary venereal prophylaxis, the rate was 179 cases per 1,000 soldiers. Preventive methods since 1909 have been made compulsory. The soldiers have become better informed as to the physical and mental disturbances from venereal diseases and instructed carefully in the prophylactic measures against them. In addition, drastic disciplinary actions, loss of pay and time, and required prophylactic treatment after sexual intercourse have lessened the incidence of the venereal diseases. The Army administration as a whole has taken part in this control measure, assisting the Medical Department. The cooperative efforts of all branches in this respect have now cut the venereal rate to 34 cases per 1,000 soldiers per annum. It is a hopeful result which is now being increasingly extended to the non-military population. The Army rate will also decrease thereby since the source of venereal diseases in the Army is in the civilian contacts. All venereal cases in the Army are isolated until cured, excepting syphilitics without open lesions who are undergoing controlled treatment. As for the Army, the progress already made does not conclude its efforts to devise a more efficient method in further reducing the venereal rate of soldiers. Though not complete it is a triumph in the field of preventive medicine. It is stated by public health authorities that of the small percentage of the clinic population who seek treatment for venereal diseases in early stages of syphilis only about one-half remain long enough to secure minimum treatment necessary to control syphilis. Could Army control measures be applied it would surely prove helpful.

The Army Strikes the Hookworm

The Army's part in tropical medicine has been executed, in large degree, away from the mainland. Among the island-workers of Puerto Rico in 1900, there existed a "debilitating anemia." An Army doctor, Colonel Bailey K. Ashford, discovered that the disease was due to hookworms and thereby laid the foundation for the eradication of the parasitic infestation. The Army assisted in an active campaign to combat the source of this anemia. Thousands of people were treated, preventing reinfestation of the soil, whereupon Puerto Ricans began to work, live, and enjoy a new health. The discovery made possible the treatment and progress of the inhabitants of our own "sunny" South, and the simple treatment and prophylactic measures used have since been extended to many other countries. Though this fact is not widely known and not as dramatic as many others, nevertheless the Army again brought happiness to countless inhabitants of Puerto Rico, the southern United States, and elsewhere.

The Army Wins With Proper Food

In the Philippine Islands, the Army encountered a disease prevalent among the natives and which frequently appeared among the American soldiers. The disease, altogether too familiar to the Orient, was called *beriberi*. It was usually accompanied by paralysis, tissue wasting, peripheral neuritis, and cardiac disturbances. Death resulted from heart failure. An Army medical officer made an intensive investigation of this disorder, discovering that it was due to eating highly milled or polished rice. He also proved that eating the husk of the rice grain would prevent the occurrence of beriberi, with the result that a rice-eating population was spared many deaths. The discovery of this food deficiency disease led to further scientific work on vitamins which are now common food topics of discussion in every housewives' magazine. Balanced diets and study of essential food elements in the diet were considered in preparing Army rations; the use of polished rice was reduced and meat and unpolished rice substituted. The application of these curative and preventive measures was soon extended to the diets of all the troops in the tropics, with complete elimination of beriberi in the Army. Colonel E. B. Vedder,¹ Medical Corps, furthered the accomplishments of the Army Medical Department by his fortunate and wise investigations of this deficiency disease. An interesting bit of data about beriberi has been recorded in reference to the Philippine Scouts. In 1909, 604 scouts were admitted to hospitals with beriberi, 50 in 1910, 2 in 1911, and since that year there has been none. Therefore, the Army presents early figures which have since been duplicated by civilians, except that they have not yet quite reached zero. It is highly improbable that the civilian rate will ever be as low, because not all civilians are subjected to as much supervision nor provided with the adequate balanced ration of the soldiers.

The Army Encounters Dengue Fever

Far away from the mosquito-infested island of Cuba, at the other side of the earth, the mosquito carried a dreaded sickness to man. The Army with one of its medical boards began a research on the illness known as "breakbone fever" which was enjoying an epidemic at Fort McKinley, near Manila, Philippine Islands. The disease had previously been confused with yellow fever and malaria. One of the members of this Army board, Colonel Joseph F. Siler,² Medical Corps, worked out in detail the mosquito's act in the transmission of *dengue fever*. Because of the severe bone crushing pain it was and is still known as "breakbone fever." Although rarely a fatal disease, it produced tremendous suffering, the relief from which was welcome. This medical officer's efforts as a member of the Army board resulted in the decrease in the incidence of the disease. The character of dengue fever is now well understood due to the continued work of this board of medical affairs. The board was known as the "Tropical Disease Board."

Army Sanitation is Victorious Over Cholera

The Tropical Disease Board and its members made many additional contributions to the advancement of medicine. *Cholera* was one of the first diseases to demand the attention of the Army and the Medical Department in Manila. The disease was disseminated by the personal habits and the ignorance of the people it affected. China and the Eastern Orient were especially involved. From March 20, 1902 to March 23, 1904, there were 166,252 cases of cholera in the Philippine Islands, from which there were 109,461 deaths. There were probably many cases and many deaths that were not reported. Compare this with the controlled efforts within the Army during the same period: In 1902, there were 485 cases, 286 deaths from cholera; in 1903, 1,479 cases, 96 deaths; and in 1904, one case and no deaths. It was a problem of sanitation, and the Army could control it readily within its own command. The Commissioner of Health, Manila, called on the Army for assistance. Thirty-one officers were detailed to duty, and, in furtherance of the plan, medical officers were made members of the boards of health and sanitation throughout the Islands where they were stationed. The prompt control of the epidemic of such a high mortality rate was another Army accomplishment which adds credit to the advent of western civilization in the Orient. There was one case of cholera, with one death, re-

¹ Retired as colonel on October 31, 1938.

² Retired from active service in 1928.

ported in the Philippine Islands for 1937; no cholera appeared in the United States in 1937. Throughout the world 198,389 cases of cholera, with 101,201 cholera deaths, were reported; 86 per cent of these were in India. All troops sailing beyond the continental limits of the United States for regions where cholera is present are inoculated against cholera before departure.

Army Veterinary Service Eradicates Rinderpest

Many years later, about 1928, in the Philippine Islands, an Army Veterinary Officer, Major Raymond A. Kelser,¹ developed a very successful vaccine against rinderpest. Rinderpest, a highly destructive disease of cattle, was fatal to many of the water buffalo which are beasts of burden in the Orient. The vaccination of the domestic animals of the Philippines with this vaccine soon decreased the disease to negligible proportions. Rinderpest is now rare in the Philippine Islands. The use of the vaccine was extended to other countries where rinderpest was prevalent. In the ten-year period prior to 1926, the annual loss of carabao and cattle from this disease averaged 18,000 animals. During the past few years animals used by the Army have been immunized against equine encephalitis and the results have been very satisfactory. Again the Army, through its veterinary services, has added a measure in animal immunization that has contributed to the economic development of the nation.

The Army Believes in Smallpox Vaccination

In one year, in the early eighteenth century, smallpox killed 25,000,000 individuals in Europe. Edward Jenner in 1801 established the value of his discovery of vaccination against smallpox by means of compulsory vaccination in Denmark. But, as time passed, the forgetfulness and the stupidity of the human race had resulted in the discard of preventive measures in Puerto Rico and the Philippines, as in many other places. Smallpox vaccination had been neglected prior to the arrival of the American troops. The disease was endemic and common in both places. The inhabitants were marked with smallpox scars, and the disease was readily disseminated in public areas and vehicles of transportation. Major John Van R. Hoff,² Medical Corps, the Chief Surgeon of the Puerto Rican command, put on an active campaign to free the island from this disease by reinstituting controlled vaccination of thousands of its people. Colonel Louis M. Maus, Medical Corps, as Commissioner of Health in Manila, likewise conducted extensive campaigns of vaccination against smallpox. Success followed the efforts of both these officers, and the uncontrolled scourge was removed from both places, relieving their inhabitants from unnecessary suffering and deaths. It was not because means of prevention were not known, but it took the United States Army to put simple, effective methods into use with imperative precision.

The use of smallpox vaccination in the Army is a routine procedure, and not a single member is omitted. In this connection, it is interesting to note this fact with the percentage of civilians who are vaccinated. Army statistics show that of the first 30,000 civilians enrolled in the Civilian Conservation Corps over 30 per cent were found unprotected from smallpox. This is a serious weakness in American preventive medicine. It has been stated that as the result of this lack of compulsory vaccination the United States continues to occupy second place in smallpox prevalence among the nations of the world. In 1937, 48 states reported a total of 11,673 cases of smallpox, the highest since 1931. But none of these cases occur in the Army. A large proportion of the civilian population has been benefitted by the receipt of smallpox vaccination while they were on active or temporary duty with the Army. The Army has proven that the presence of this unnecessary disease depends upon the extent of the application of vaccination.

Anopheles Falls for the Army

Malaria was a disease well known to the ancient Romans. It was called the "ague," a disease of chills and fevers, by the colonists of North America. The first successful step

¹ Now Brigadier General. Chief of the Veterinary Corps.

² Hoff Hall, the school building of the Medical Field Service School, was named in his honor.

made toward combatting it was taken in the tropics by the natives, who drank a bitter fluid with the taste of bark. This fluid came from chinchona bark, from which our present active antimalaria element, quinine, is recovered. But that was curative and not preventive medicine. It did not relieve individuals from the suffering they had to endure while having the disease. In 1880, a French Army surgeon in Algeria, Alphonse Laveran, discovered the microscopic animal parasite in the blood of malaria victims. In 1897, Ronald Ross of the Indian Medical Service, British Army, discovered the same parasite in the stomach of the anopheles mosquitoes that had sucked the blood of patients with this disease. This made possible the control of malaria by eliminating the mosquito. Although malarial preventive measures were demonstrated on a small scale in other countries, it was not until the Spanish-American War that they were convincingly demonstrated on a large scale by the American troops. The United States Army soldiers were required to use mosquito nets and to carry on an active campaign against mosquito breeding and destruction. While combatting the breeding of the yellow fever mosquito in Cuba and Panama, the Army at the same time reduced the incidence of the breeding of the Anopheles mosquito. The malarial case rate decreased concomitantly with that of the yellow fever. Since the Anopheles mosquito is more domestic in its habits of breeding than the Aedes aegypti mosquito, its control is more difficult. Therefore the incidence of malaria cases has not decreased proportionately to that of yellow fever. The Army has made progress in spite of the arduous preventive measures necessary to insure control. Note the following malaria case rates in the Army: In 1901, the rate was 708.52 cases per 1,000 soldiers; in 1902, 272.3 per 1,000; in 1907, 63.19 per 1,000; and in 1927, 6.73 per 1,000.

The rate is declining each year, even though more accurate methods of diagnosing the disease are used. Seventeen varieties of the Anopheles mosquito are now known, further confirming the practical difficulties in eradicating the malaria carrier. Malaria causes more disability throughout the world than any other disease. The grouped efforts of medical officers of the Army throughout its jurisdiction have controlled the disease to a great extent. One medical officer, Colonel Charles F. Craig, made many extensive investigations and has written and advanced much information about malaria. To him and the Army as a whole, medicine owes a great deal for the practical knowledge and preventive measures against the disease.

Recently an Army medical officer, Colonel Leon Fox, had a prominent part in the discovery of a new malaria vector, the *Anopheles bellator*, a mosquito whose breeding place of choice is among the leaves of an air-plant that grows in the upper branches of trees used as shelter for growing the cocoa plants.

Army Hygiene Controls Dysentery

During the Spanish-American War, one of the chief diseases which afflicted our troops in the tropics was dysentery. Bacillary and amoebic dysentery both played their part. Extensive studies and investigation were made by the Army with the result that much progress was made toward the control of dysenteries. Colonel Craig, in addition to making malaria studies and investigations, included amoebic dysentery, from which much of our present information regarding the disease originated. Colonel E. B. Vedder, Medical Corps, was one of the early advocates of the use of emetine in the treatment of amoebic dysentery. With concerted efforts the Army secured results as is indicated by the following rates: In 1900, the admission rate for dysenteries was 145.13 cases per 1,000 soldiers; in 1901, 82.65 per 1,000; in 1902, 62.03 per 1,000; in 1907, 18.09 per 1,000; and in 1926, .02 per 1,000; and since that time for the entire Army less than 1 per 1,000 per year.

Thus is noted again the rigidity of preventive medicine in the Army, which is difficult to transpose to the civilian population.

The Army Shuts Out the Bubonic Plague

Bubonic plague came under the study and investigation of the Army medical boards. It is a fearful and highly dreaded disease. It confronted the United States Army in the Philippine Islands, prompting the first American studies of this disease. The Board

issued a circular about plague in February, 1901, during its extensive outbreak in Manila. Although the transmission of the disease by fleas was not known at the time, nevertheless, by means of supervised sanitary control measures, the disease was kept out of the Army. The epidemic in Manila was controlled by Army medical officers. Since the transmission of the plague by the flea has become known, the campaigns of all governmental agencies including the Army have practically eradicated the disease from America. The United States Public Health Service is now carrying on the necessary plague-suppressive measures.

The Dental Corps Curbs Heart Disease

In another field of endeavor the dental officers of the Army have over a period of time made a most welcome progress by reducing the suffering and non-effectiveness which results from valvular heart disease, arthritis, and rheumatism. Diseases of this class in the Army have decreased over 90 per cent during the past 25 years. This decrease has been of marked benefit. Every member of the Army has a dental survey at least once each year; then proper treatment is scheduled and conducted for the individuals having defects. Removal of apical abscesses, curing gum infection, and care of carious teeth and dental cavities have shown progressive health benefits. Note the progress in this field as indicated by admission rates for rheumatic fever: In 1900, the rate was 5.28 cases per 1,000; 1902, 5.22 per 1,000; 1926, 0.53 per 1,000; and since that time less than 1 per 1,000 per annum. The Dental officers, though not heralded with publicity, have quietly and conscientiously assisted the medical officer in efforts to preserve the fighting strength of the Army. In conjunction with the dentists, the medical officers have removed other foci of infection, especially diseased tonsils. It is evident that much success has come from this cooperative work, which will become better understood as the younger generation reaches the arthritic ages.

The Army Advanced the Physiology of Digestion

The first American experimental physiologist was a surgeon in the United States Army. The Army assisted him in carrying out his experiments in the physiology of the stomach, which were the starting point for our modern ideas concerning digestion and dietetics. While stationed at Fort Mackinac in northern Michigan just after the War of 1812, Surgeon William Beaumont was called to treat a young voyager, Alexis St. Martin, who was accidentally shot in the abdomen. Beaumont, familiar with the treatment of gunshot wounds, took the patient into his own home and nursed him back to health. The wound, however, developed into a fistula leading from the stomach to the surface, offering a means of investigation of digestion in the stomach. Beaumont immediately appreciated this opportunity and began a series of careful experiments. Surgeon General Joseph Lovell, then head of the Medical Department, assisted Surgeon Beaumont by having the patient enlisted in the service, so that he could be studied and kept under control without expense to the patient or to William Beaumont. From the careful and experimental investigations, the investigator published his report on "Experiments and Observations on the Gastric Juice and the Physiology of Digestion" in 1825. In this report were described: the appearance of the normal mucous membrane of the stomach; the movements of the stomach during digestion; that gastric secretion occurred after taking food and was not continuous; the observations on the effects of the stomach secretion on various foods; that the digestive juices of the stomach depended on hydrochloric acid and some other substance (later discovered to be pepsin) for their effects. This contribution to American medicine is most noteworthy and was due in no small part to the encouragement that William Beaumont received from his Army colleagues. His patient, Alexis St. Martin, lived an active life despite his fistula until his death at the age of 82 years. The Army doctor is still privileged to carry on individual research and investigation with the encouragement of the Medical Department, in the same manner as in Dr. Beaumont's period of service.

The Army Made America's Greatest Gift to Medicine

There is another contribution worthy of mention, unique in its kind and priceless in value, a heritage of the Army. That is the *Army Medical Library*, an unreplaceable treasure,

the loss of which would be felt by the entire world. For over one hundred years, since 1836, the Medical Department has painstakingly accumulated a precious possession and is holding it in trust for the world. It contains approximately a million books and pamphlets published in all parts of the civilized world from the earliest days to the present time, the rarest and most extensive collection of ancient medical books in existence. It is the largest and greatest medical library in the world. The wealth of material within its collection is available to any responsible individual for study. The usefulness of the library is the result of patient and concerted efforts of medical officers who sensed its value to the nation many years ago and to those others who have continued their efforts. The Army Medical Library has rightfully been termed "America's greatest gift to medicine" and "the pride of the medical profession of the United States."

Army Improves Traumatic Surgery

Many other achievements and interesting activities have been accomplished by the Army Medical Department and its members. Medical officers of the World War made numerous advances in surgery and orthopedics. The use of antiseptics in the treatment of wounds led to the use of Carrell-Dakins solution now so well known. In the Civil War 31,978, a ratio of 10.48 per 1000, died from wounds in hospital, and in the World War 13,691, a ratio of 4.5 per 1000.

The Medico-Military Man

Problems will always confront the medical officer as he ventures forth with the Army in conflict or exploration. To plan intelligently it is necessary for him to have a broad general knowledge of military science, so that he may know the principles which regulate the conduct of a campaign. As a member of the unit staff in the field he must have a sufficient military knowledge to insure rendering professional information as may be of valuable assistance in the development of the military plan. Such are his duties in war, and these duties contain many variations and increases from the normal. Herein lies the necessity for continuous military training of the Medical Department Reserve Officer, so he will be able to adapt himself readily, to the military plan.

Probably the most commonly known and spectacular duties of the medical officer involve the care of the wounded in battle. They are not, however, the most important. The preservation of the strength of the command is best maintained by the prevention of contagious diseases and the control of epidemics. History contains many instances where diseases have destroyed armies, and victories have been lost by a scourge of disease rather than the enemy bullets or weapons. The Army doctor must be a good public health officer. He must have a thorough knowledge of camp sanitation, water supply, sewage disposal, food inspection, mosquito control, louse control, and other allied subjects. The professional attainment of the medical officers in the field comes by years of training and experiences in the Army. It is an interesting, useful life of unlimited importance.

The career of the medical officer in the United States Army may not offer so great a financial reward as that of the successful civilian doctor. However, there are compensations for those who wish to advance the general medical science. There is no group of professional men which has accomplished more in this direction than have Army medical officers. Their contributions have been numerous, their efforts sincere and purposeful, of value unredeemable in money. Many diseases which once took a heavy toll of American lives and caused much suffering are becoming almost extinct, because of their experiments, the investigating researches, and practical application of their knowledge. The service of the Medical Department is by no means devoted to the Army itself. The discoveries in preventive medicine, the improvements in sanitation, and the production of vaccines have been extended to the public.

Silent Success

Medical progress is most manifest in the negative—the absence of disease. Today there are many memorials to the building and economical progress of our nation represented in concrete and steel visible to all. But who considers the medical triumphs that

were necessary to the existence of these engineering monuments? Take away the lessons of preventive medicine now in use and within a decade the glorious structures with the industries that accompany them would soon be empty and idle in a land of fearful disease. The world is a healthier place in which to live and so kept through the relentless application of the lessons of preventive medicine. Few people realize the efforts which are made by the members of the medical profession, and altogether too few are acquainted with the role of the Army-doctor in this task. A search into the historical literature of medicine will convince the investigator that Army doctors of all nations, especially those of the United States Army, have been gallant warriors in the battle against disease. The Army doctors have practiced medicine which deserves due respect. The record of the Army and its Medical Department is an enviable and honorable one. Association with this great institution of progress develops loyalty and sincerity of purpose. Individualism, essential facilities, cooperation, assistance, and the spirit of progress embody Medical Department members in a united effort. In it they find a position in which they can serve humanity, practice advanced medicine, control and observe results, and carry on biological and clinical investigations on a large scale, thereby making a healthier and happier world for posterity. What else could cope so well with the Oath of Hippocrates?

CHAPTER II

ORGANIZATION AND ACTIVITIES OF THE MEDICAL DEPARTMENT

THE PURPOSE OF THE MEDICAL DEPARTMENT

The Medical Department is responsible for the health of all military personnel and animals of the Army. Commissioned or enlisted personnel must be physically and mentally qualified according to the standards established in the Army Regulations, and the examination must be conducted by authorized members of the Medical Department. The department then endeavors to keep all personnel physically fit during their service and in as nearly normal health as possible upon discharge from the Army. The department also has charge of the veterinary service for the Army animals. To attain its objective the Medical Department is constantly engaged in doing research work in order to develop the best that medical knowledge can provide. In short, the mission of the Medical Department is to *conserve the fighting strength* of the United States Army.

COMPONENTS AND DISTRIBUTION OF THE MEDICAL DEPARTMENT

According to the present organization, the Medical Department consists of a Surgeon General, four assistants to the Surgeon General, the Medical Corps, the Dental Corps, the Veterinary Corps, the Medical Administrative Corps, the Army Nurse Corps, the Medical Department enlisted personnel, and a small number of contract surgeons. In addition, the Organized Reserves have a Sanitary Corps.

The officers of the several corps of the Medical Department and its enlisted men are distributed in all military stations throughout the United States, Alaska, and in overseas theatres. They are located at every type of military establishment, including institutions of military education, centers of technical production, and the posts of tactical organizations of troops. The sanitation and health supervision of each station is under the control of a station surgeon, a medical officer. Officers of the Medical Corps, Dental Corps, Veterinary Corps, Medical Administrative Corps, Army Nurse Corps, and enlisted men of the Medical Department are allotted to each station according to the needs of the garrison and to tactical organizations during field training. To provide medical attention for groups of military personnel not located at army stations, general dispensaries staffed with Medical Department officers and enlisted men are established at centers of military activity.

Excluding the Surgeon General's Office and the exempted stations and establishments directly under the War Department, the medical activities of the stations are under the control of the respective commanders of the service commands or departments in which they are located. The administrative control is under the supervision of a Medical Department advisor to the commanding general of the service command. This officer of the Medical Corps is known as the surgeon of the service command. These medical supervisors in the Departments of Panama, Hawaii, and Puerto Rico, are known as department surgeons. The surgeon of each service command and department has an assistant from the Dental Corps and one from the Veterinary Corps.

THE SURGEON GENERAL

The Medical Department is classified as a "service," in contrast to the "arms." The chief of this service is the "Surgeon General of the Army." He has the military grade of major general, and the assistants to the Surgeon General have the grade of brigadier general. These officers are selected by the President and hold their appointments for a period of four years. The Surgeon General is selected from among the list of colonels of the Medical Corps, and the assistants to the Surgeon General from Medical Department officers having at least 15 years of commissioned service. They are assigned to important positions within the Medical Department.

The Secretary of War promulgates as compulsory regulations the principles and policies

governing the operation of the medical service of the Army upon recommendation of the Surgeon General presented through the Commanding General, Services of Supply. Therefore, The Surgeon General is able to establish a unified policy of medical service for the Army Ground Forces, the Army Air Forces, the Services of Supply, the Task Forces, the Defense Commands, and the Theatres of Operation.

THE OFFICE OF THE SURGEON GENERAL

The Surgeon General maintains an office termed "The Office of the Surgeon General," the abbreviation for which is SGO. In this office the policies and practices pertaining to the different functions of the Medical Department, its personnel, and its fiscal matters are elaborated and coordinated within the department and with the other agencies of the War Department. The relations of this office with the Commanding General of each Service Command and each Department are conducted through The Adjutant General's Office of the War Department. Correlation with the other forces is obtained through representatives of the Medical Department assigned to the Army Air Forces and the Army Ground Forces. Inasmuch as the Surgeon General heads the Medical Department the divisions and subdivisions of his office include functionally all the activities of the Department (see Plate 1). Each major activity is organized as a separate unit.

The functions of the medical service of the Army Air Forces are coordinated by the Surgeon General through the Air Surgeon.

The Executive Officer. The Executive assists the Surgeon General and coordinates the work of all divisions and branches. During the temporary absence of the Surgeon General and/or the Deputy Surgeon General, or when authorized to do so the executive acts as his representative. He is usually a colonel of the Medical Corps.

Administrative Services. The Administrative Division under the Chief of Administrative Services is divided into four divisions, *Office Administration Division, Vital Records Division, Research and Development Division and Historical Division*. The subdivisions of the Office Administration Division are: *Editorial and Review Branch, Mail and Records Branch and Office Communications and Reproduction Branch*. The subdivisions of the Vital Records Division are: *Individual Records Branch, Health Reports Branch, Statistical Analysis Branch, Machines Branch and Selective Service Branch*. The Division of Vital Records is charged with the classification of records relating to sick and wounded which, from an economical and professional standpoint, are extremely valuable and form the basis for the administrative action in regard to claims, awarding of pensions, and disability compensation. The subdivisions of the Research and Development Division are: *Civilian Liaison, Development Branch and the Research Branch*.

Professional Services. The Professional Services Division under the Chief of Professional Services has charge of the management of the professional services of the Medical Department. It evaluates advances in medicine and allied sciences important to the military establishment. It is composed of five divisions, *Medical Practice Division, Preventive Medicine Division, Dental Division, Veterinary Division and Nursing Division*. The Medical Practice Division has to do with the accepted methods of medical practice and the advances made in medicine and surgery. Policies concerning medical practice in the Army are coordinated in cooperation with civilian medical centers, Army general hospitals, station hospitals and Army Medical School. The subdivisions of the Medical Practice Division are: *Surgery Branch, Medicine Branch, Neuropsychiatry Branch, Nutrition Branch, Procurement and Advisory Branch, Adjutant General's Liaison Branch and Physical Standards Branch*.

The Preventive Medicine Division has supervision over military sanitation and the control of communicable diseases, except among animals, and includes the operation of the Medical Department Laboratories. The subdivisions of the Preventive Medicine Branch are: *Sanitation Branch, Sanitary Engineering Branch, Laboratories Branch, Venereal Disease Control Branch, Occupational Hygiene Branch, Medical Intelligence Branch and Epidemiology Branch*.

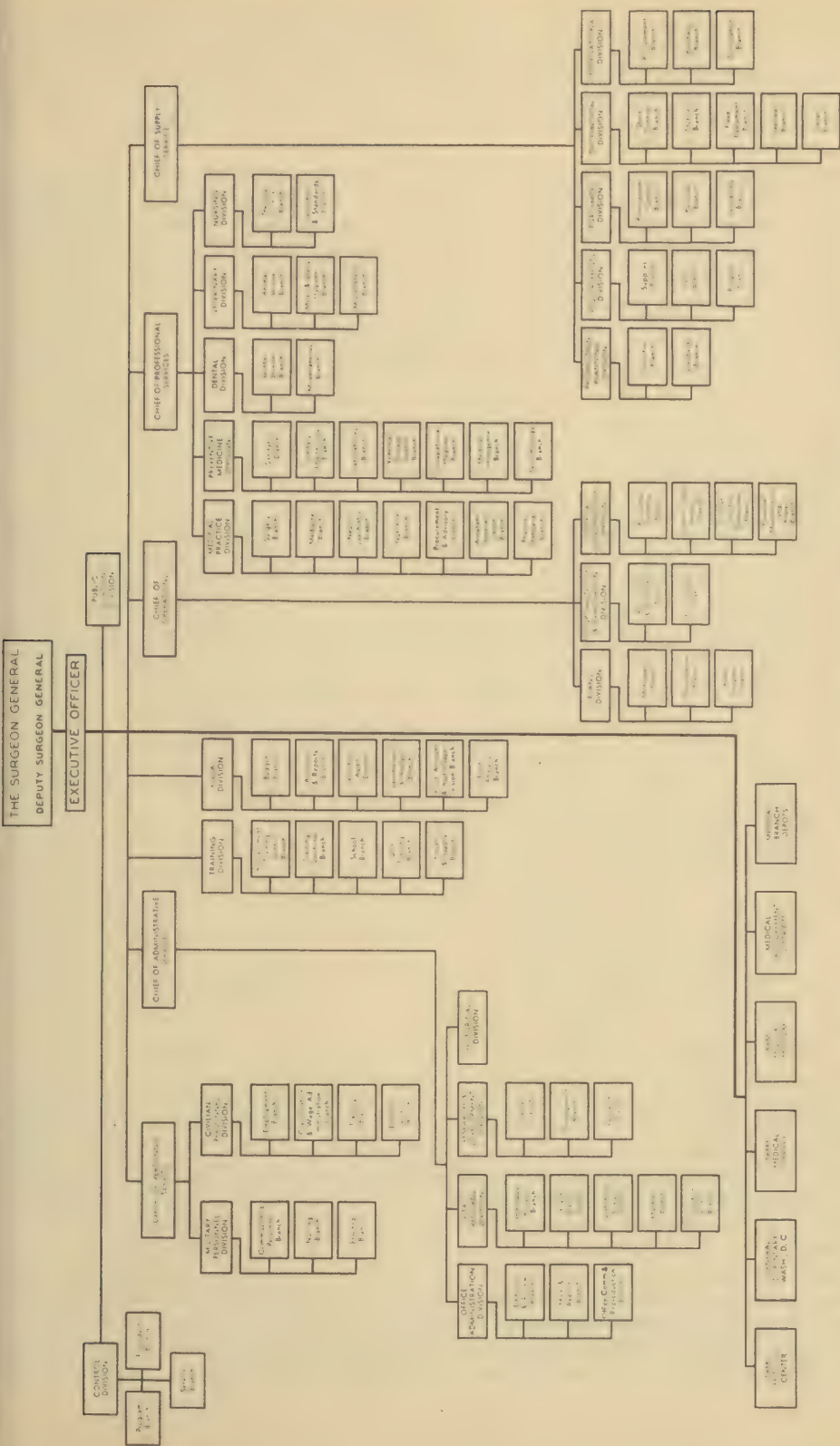


Plate 1. Office of the Surgeon General, a Staff Division of the Services of Supply.

The Dental Division supervises matters relating to the Profession of dentistry in the army and its subdivisions are: *Dental Service Branch and Miscellaneous Branch.*

The Veterinary Division has general supervision of the veterinary service in the army, particularly from the professional standpoint. It is charged with the inspection of food, particularly meat and dairy products, purchased by the Quartermaster Corps. Its subdivisions are: *Animal Service Branch, Meat and Dairy Hygiene Branch and Miscellaneous Branch.*

The Nursing Division has general charge of the procurement and assignment of army nurses and the more intimate responsibilities connected with this service. It has extensive control of the personnel records of the Army Nurse Corps and liaison is maintained with the Nursing Service of the American Red Cross which is charged with the procurement of reserve nurses for the federal service. Its sub-divisions are: *Nursing Service Branch and Selection and Standards Branch.*

Personnel Services. The Personnel Division under the Chief of Personnel Service administers all matters relating to the commissioned, enlisted and civilian personnel of the Medical Department. It is composed of the *Military Personnel Division and the Civilian Personnel Division.* The sub-divisions of the Military Personnel Division are: *Commissioned Personnel Branch, Nursing Branch and Enlisted Branch* while the Civilian Personnel Division is divided into four branches: *Employment Branch, Classification and Wage Administration Branch, Training Branch and Employee Service Branch.*

Supply. Supply under the Chief of Supply Service is composed of five divisions, *Production Planning Division, Requirements Division, Purchase Division, Distribution Division and International Division.* The Production Planning Division is subdivided into *Facilities and Standards* branches. The Requirements Division is charged with the computation of requirements and its sub-divisions are: *Supplies Branch, Factor Branch and Program Branch.* The Purchase Division is charged with procurement and has three branches, *Procurement Control, Purchase and Expediting.* The Distribution Division is sub-divided into *Stock Control Branch, Station Branch, Field Equipment Branch, Overseas Branch and Cargo Branch.* The International Division's sub-divisions are: *Procurement Branch, Purchase Branch and Distribution Branch.*

Operations. The Chief of Operations has charge of the *Plans Division, Hospitalization and Evacuation Division and the Hospital Construction Division.* The Plans Division is charged with the preparation of war plans, defense projects, tables of organization, and tables of basic allowances for the Medical Department and supervision of experimental development of types of field equipment for individuals and units of the Medical Department. Its sub-divisions are: *Mobilization Branch, Organization Branch and Field Equipment Branch.* The sub-divisions of The Hospitalization and Evacuation Division are: *Bed Credits and Evacuation Branch and Miscellaneous Branch.* The Hospital Construction Division, charged with the preparation of plans for hospital construction and maintenance is subdivided into: *Air Corps Facilities Branch, Ground Troops Facilities Branch, Civilian Facilities Conversion Branch and Hospital Maintenance and Repair Branch.*

Training Division. The Training Division is charged with the preparation of policies and plans for the training of the Medical Department and the Reserve Officers' Training Corps; the preparation of Medical Department training regulations; the supervision of Medical Department special service schools; the authorization of projects for the issuance and distribution of bulletins and other printed matter from the Medical Field Service School; the supervision of Medical Department Replacement Training Centers and Officer-Candidate Schools. Its sub-divisions are: *Replacement Training Center Branch, Training Doctrine Branch, School Branch, Unit Training Branch and Fiscal and Supply Branch.*

Fiscal Division. The Fiscal Division has charge of all finance responsibilities. It is concerned with funds necessary for the functioning and operation of the Medical Department. It prepares estimates of requirements for funds; apportions funds to activities of the Surgeon General's Office; prepares defense of estimates for presentation before the supervising budget agencies and Committees of Congress; maintains a control ledger

of all funds appropriated to the Medical Department, funds received from other services, and from the sale of medical supplies and equipment. It reviews and approves for payment vouchers for civilian medical, hospital, nursing and ambulance service for medical personnel and other claims that may arise in connection with Medical Department activities. Its sub-divisions are: *Budget Branch, Accounts and Reports Branch, Voucher Audit Branch, Expenditures and Analysis Branch, Field Account and Audit Supervision Branch, Cost Analysis Branch.*

Medical Corps. The Medical Corps is a commissioned component of the Medical Department. An applicant for commission must be a graduate of an acceptable medical school legally authorized to confer the degree of doctor of medicine, and must have had at least one year's hospital training in an approved hospital subsequent to the completion of a 4-year course of instruction in such medical school or its equivalent in practical professional experience as determined by The Surgeon General in each case. Further each applicant for commission must successfully pass a rigid physical examination, and must be found by an examining board to possess the necessary aptitude and adaptability for military service. For detailed information relative to appointment in the Medical Corps, Regular Army, see AR 605-20.

All members of the Medical Corps of the Regular Army are given a broad basic experience through formal training and duty assignments early in their military careers which qualifies them generally for the usual assignments in the service either in peace or war. This training lies within the fields of preventive medicine, sanitation, medicine, surgery, and field duties. Later, the training tends toward either the professional or administrative duties. With the exception of about ten per cent of the Corps, specialization is not exclusive but rather it is additional to practical experience in all duties to which a medical officer may be assigned. A few selected officers of the Medical Corps attend the Army War College, the Army Industrial College, the Command and General Staff School, the Infantry School, and the Chemical Warfare School. Medical officers are also assigned as instructors at these schools. Due to the urgent need for officers in the field, the Army War College closed in 1939 and the Army Industrial College was discontinued in 1941.

In peace time, for each promotion in the Medical Corps of the Regular Army an officer is given a professional examination and a physical examination. Failure to meet the physical requirements results in the officer's retirement in the next higher grade. Failure to meet the professional requirement, in the case of junior officers, results in discharge with a year's pay. After the lapse of a year a reexamination is given field officers; should they again fail they are retired in the grade actually attained. The fixed intervals required for promotion (AR 605-50) are as follows:

First lieutenant	upon appointment.
Captain	after three years' service.
Major	after twelve years' service.
Lieutenant colonel	after twenty years' service.
Colonel	after twenty-six years' service.
Brigadier general or major general	by Presidential appointment in accordance with law.

Since the declaration of War, officers of the several components of the Medical Department have received temporary promotions in the same manner as provided for all officers of the Army.

The Dental Corps. The Dental Corps is a commissioned component of the Medical Department consisting of dentists. For detailed information relative to appointment in the Dental Corps, Regular Army, see AR 605-20.

The method of promotion of dental officers is the same as described for officers of the Medical Corps.

Officers of the Dental Corps attend the basic courses of instruction at the Medical Field Service School and the Army Dental School early in their careers; later in their service they are eligible to attend the Advanced Graduate or Specialists' Courses at the Army Dental School. Selected officers are sent to civil institutions for special instruction,

The Dental Corps conducts the dental service for the Army, preserving and promoting the dental health of all military personnel. The dental officer is governed by a definite policy of treatment applied to classified patients in order that he may accomplish the greatest good for the group. The secondary mission of the Dental Corps is to assist the Medical Corps during combat. In addition to their dental services they assist in emergency treatment, evacuation, and such other emergency activities as may be delegated.

The senior dental officer of a command is known as the "dental surgeon." Dental officers are assisted in their work by enlisted men (dental technicians) of the Medical Department who have been trained locally or through special courses conducted at the Army Dental School.

The Veterinary Corps. The Veterinary Corps is a commissioned component of the Medical Department consisting of veterinarians. Since the declaration of War in 1941, the chief of the Veterinary Service, who has an office in The Surgeon General's Office, has been promoted to the temporary grade of Brigadier General, Army of the United States. The system of promotion for the veterinary officers is the same as for the Medical and Dental Corps.

The Veterinary Corps conducts the veterinary service for the Army. Their duties involve the preservation and promotion of the health of Army animals and the inspection of dairy and meat products purchased for the Army. This inspection of foods is to determine whether or not they comply with federal specification requirements and War Department contracts under which they are purchased by the Quartermaster Corps.

The Sanitary Corps. The Sanitary Corps, which is a reserve component of the Medical Department, comprises individuals having skill in sciences and vocations technically allied to the functions of the Medical Department, such as chemists, food and nutrition experts, hospital architects, producers of medical supplies, psychologists, public health specialists, and sanitary engineers.

The Medical Administrative Corps. Medical Administrative Corps officers assist in the administrative affairs of the Medical Department in such capacities as medical supply officers, registrars, detachment commanders, adjutants, personnel officers, instructors, mess officers and in tactical medical units may serve as administrative officers and ambulance and litter bearer platoon leaders. Qualified pharmacists may be assigned to manage hospital pharmacies or other duties which pertain to their profession.

Formerly the Medical Administrative Corps was chiefly composed of officers who, prior to their appointment, were experienced noncommissioned officers of the Medical Department. After June 24, 1936 original appointments in the Regular Army were restricted to pharmacists between the ages of 21 and 32 who were graduates of acceptable schools or colleges of pharmacy requiring four years of instruction for graduation and legally authorized to confer the degree of bachelor of science in pharmacy or its equivalent.

The increase in the Medical Administrative Corps for the present emergency is being accomplished by the appointment of warrant officers and enlisted men to the Officer-Candidate Schools for the Medical Administrative Corps at the Medical Field Service School, Carlisle Barracks, Pennsylvania, or the Medical Replacement Training Center, Camp Barkeley, Texas. A few selected qualified enlisted men in the Regular Army are given original appointments by the War Department. For further details see section "Officer-Candidate Schools."

The Army Nurse Corps. The Army Nurse Corps consists of female nurses having the following grades, with relative rank, in order of importance from the lowest to the highest: Nurse (relative rank of second lieutenant), Chief nurse (relative rank of first lieutenant), Assistant director (relative rank of captain), Director (relative rank of captain), Assistant superintendent (relative rank of captain), and Superintendent (relative rank of major). (AR 40-20). The Superintendent of the Army Nurse Corps during the present emergency holds the relative rank of Colonel. Two assistants hold the relative rank of Lieutenant Colonel and Major respectively.

Appointments in all grades, except that of Superintendent, are made by the Surgeon General with the approval of The Secretary of War from among physically qualified,

registered female nurses who are citizens of the United States, between 22 and 30 years of age, unmarried, and graduates of accredited high schools and schools of nursing of approved standards, or has a record of desirable post-graduate training or experience. The Superintendent of the Army Nurse Corps is appointed by The Secretary of War.

Nurses have the relative rank and the rights and privileges of commissioned officers with the exception that their pay and allowances and mileage are on a different scale. Upon original appointment, members of the Army Nurse Corps are given the relative rank of second lieutenant. Promotion to the higher grades to include major is determined by length of service and selection.

Army nurses are stationed in medical establishments according to the needs of the service. AR 40-20). Their duties are similar to those of a civilian nurse in hospitals of like character.

Contract Surgeons. In emergencies civilian physicians may be employed as general (full-time) or special (part-time) contract surgeons under contracts entered into by the Surgeon General with the approval of the Secretary of War. The professional and administrative duties of a contract surgeon are the same as those of an officer of the Medical Corps, except in so far as they are limited by the fact that the contract surgeon does not perform his functions by virtue of military rank or commission. Employment as a contract surgeon is limited to graduates of reputable medical schools legally authorized to confer the degree of doctor of medicine. He must be a licensed practitioner of medicine in good standing at the time the contract is made. He must also, in the opinion of the contracting officer, possess satisfactory moral, professional, and physical qualifications. (AR 40-30).

Pay and allowances are the same as commissioned officers serving in the second pay period. A part-time contract stipulates the compensation in the contract. Civilian physicians employed under part-time contract are not entitled to subsistence or rental allowances. (AR 35-1920, AR 35-4820 and AR 35-4830.)

Officers' Reserve Corps. The Medical Department Reserve consists of a body of civilians qualified and willing to serve as officers of the various components of the Medical Department in time of emergency and war. They have been given appropriate commissions and assignments in preparation for such service.

The sections of the Officers' Reserve Corps pertaining to the Medical Department are as follows: Medical Corps Reserve, Dental Corps Reserve, Veterinary Corps Reserve, Sanitary Corps Reserve, and the Medical Administrative Corps Reserve. The missions of the several corps and the qualifications of their members are analogous to those of the corresponding Corps of the Regular Army. The Medical Administrative Corps Reserve is selected from candidates who have had experience in administrative duties comparable to those performed in medical units and establishments. Also see section "Officer-Candidate School."

The Reserve Officers' Training Corps. The medical branch of the Reserve Officers' Training Corps is composed of a group of medical students in certain selected medical schools pursuing courses of instruction prescribed by the War Department to prepare them for commission in the Medical Corps Reserve of the Army.

The maintenance of these instruction units at civilian institutions is authorized by Section 40-47c of the National Defense Act as amended, and in their operation the War Department and the institution assume a joint responsibility. An officer of the Medical Corps, Regular Army,* is assigned at each school to conduct the instruction. The school insures a membership of at least fifty students, provides for ninety hours of instruction per year, and makes the basic course, when entered upon, an academic requisite for graduation, unless the student is released. Membership in these units is voluntary.

The 23 institutions which in the fiscal year 1941 maintained medical units of the Reserve Officers' Training Corps are: Boston University, University of Vermont, Cornell University Medical College, Syracuse University, University of Buffalo, Georgetown University, George Washington University, Jefferson Medical College, University of Pennsylvania, University of Pittsburgh, Medical College of Virginia, Vanderbilt Uni-

versity School of Medicine, Indiana University, Ohio State University, Western Reserve University, University of Michigan, the State University of Iowa, University of Minnesota, St. Louis University School of Medicine, Washington University, Baylor University, University of Oregon Medical School, and the University of California.

The prescribed courses of instruction extend through the four years of the medical school curriculum, the first two years constituting the Basic Course and the last two years the Advanced Course. A summer training camp period of six weeks is also required. Enrollees in the advanced course, which carries a nominal rate of compensation, are selected from students who have successfully completed the basic course.

A medical student cannot be enrolled in the Reserve Officers' Training Corps unless he is a citizen of the United States and is physically qualified for military service. Upon graduation from the Advanced Course and recommendation by the Professor of Military Science and Tactics and the school authorities, he is granted a commission in the Medical Corps Reserve of the Army.

MEDICAL REPLACEMENT TRAINING CENTERS

Three medical replacement training centers were established by the War Department during 1941 and one in 1942. These four centers provide facilities for the training of a large number of selectees each training cycle. They are: Camp Barkeley, Texas; Camp Grant, Illinois; Camp Pickett, Virginia; and Camp Joseph T. Robinson, Arkansas. The center at Camp Barkeley also conducts an Officer-Candidate School for Medical Administrative Corps officers.

At the medical replacement training centers selectees participate in an 8-week training period as outlined by the Mobilization Training Program 8-5, after which they are sent to medical units where they continue unit training within the organization to which they are assigned. Selected trainees are sent from the replacement centers to enlisted technicians' schools for special technical training before they are assigned to medical units. Several additional schools for trainees are also conducted at the centers. They include: a Clerks' School, a Chauffeurs' School; a Mechanics' School; a Bakers' and Cooks' School; a Sanitary Technicians' School; and an Officer-Candidates' Preparatory School.

Trainees to attend these schools are selected by classification during their first few days at the center. After two weeks of basic training they report to the respective school for which they have been selected (except chauffeurs and sanitary technicians) where they continue training for the remaining six weeks. If qualified they are requisitioned and shipped accordingly.

Trainees not selected for such schools continue the basic and regular training for medical units.

Each Center conducts an Officers' Refresher Course for Medical Department Pool Officers.

OFFICER-CANDIDATE SCHOOLS

The Medical Department operates two officer-candidate schools for the Medical Administrative Corps: one at the Medical Field Service School, Carlisle Barracks, Pennsylvania; the other at the Medical Replacement Training Center, Camp Barkeley, Texas. Each warrant officer and enlisted man who applies for this training is considered for attendance. The primary quality sought is proven leadership capacity. The length of the course is three months. Successful graduates are appointed second lieutenants of the Medical Administrative Corps, and assigned to duty with medical units or installations where their services are needed at the time of their graduation.

In addition to the officer-candidates selected from medical units a large number of officer-candidates are enlisted men who have completed their training in Medical Replacement Training Centers. The trainee must complete three months of service before he is eligible to the Officer-Candidate School, except that a trainee may be ordered to an Officer-Candidate School regardless of his length of service when in the opinion of the

* Retired officers used during war.

enlisted man's company or detachment commander, the applicant is by reason of education, experience or prior service and his current state of training qualified to complete satisfactorily the course of instruction. Trainees may be held in an Officer-Candidate Preparatory School at the Medical Replacement Training Center for a period of one month in order to complete the requirement of three months' service. Upon completion of Officer-Candidate Preparatory School selected applicants of the class are sent to the Officer-Candidate School. Any enlisted man is privileged to make application at any time after three months' service even though he has not been selected on the original application.

Selected applicants are chosen when the candidates appear before an Officer-Candidate Board which must consist of one field officer and two other officers preferably from the same branch for which the Board is being held. *Accepted applicants* in excess of the quota allowed for the Center are held to fill vacancies which might occur in the Officer-Candidate Schools.

THE ARMY MEDICAL CENTER

In 1923, during the administration of Surgeon General Merritte W. Ireland, the War Department issued orders directing that Medical Department facilities in the Takoma Park section of the District of Columbia be known as "*The Army Medical Center, Washington, D. C.*" Its purpose was to place in one location the clinical facilities for the professional care of sick and injured, the training schools for medical department personnel, and the equipment for research and the manufacture of biological products.



Plate 2. The Army Medical Center.

The center was established in 1923 and continues to fulfill the purposes for which it was created. It consists of the Walter Reed General Hospital, The Army Dispensary, the Army Medical Department Professional Schools, and the biological laboratories. This need for a centralized military medical establishment was realized during the World War.

The center is located in Washington, D. C., about 6 miles northwest of the Capitol in a beautiful landscaped area of 110 acres. This location provides close coordination with the Surgeon General's Office, the Army Medical Museum, and the Army Medical Library.

Command and Organization. For many years past the Army Medical Center has been commanded by assistants to the Surgeon General, who have been brigadier generals of

the Medical Department. The Assistant Commandant, a colonel, has charge of the schools and training. The hospital has a commanding officer responsible for its internal administration. The Commanding General, in addition to medical personnel, has on his staff, officers of the Quartermaster Corps, Finance Department, and representatives of the Signal Corps and Ordnance Department.

Walter Reed General Hospital. The Walter Reed General Hospital was built in 1908 and named in honor of Major Walter Reed, Medical Corps, United States Army, who proved the means of transmission of yellow fever. It is a general hospital equipped to treat all types of cases, including diagnosis and treatment of acute and chronic diseases as well as injuries. Normally it has a capacity of 1200 beds, which are about equally divided between medical and surgical. Women and children who are dependents of military personnel are admitted to the hospital when beds are available. Each year approximately 7500 patients are admitted to the hospital; of these 45 per cent are medical and 55 per cent surgical.



Plate 4. Walter Reed General Hospital.

During the year 1939, a part of the activities of the General Dispensary in the Munitions Building of the War Department was transferred to the Army Medical Center. That part of the activities of the Dispensary which remained in the Munitions Building treats the military personnel on active duty in the various departments of the War Department. The dispensary at the Center handles more serious cases among the military personnel and conducts a large outpatient clinic for the families and retired officers and their families living in and near Washington, D. C. Its location in the Army Medical Center permits utilization of the most modern methods of diagnosis and treatment, facilitated by available laboratory means and adequate equipment.

The **Medical Department Professional Service Schools** are located in buildings separated from the hospital. They include the *Army Medical School*, the *Army Dental School*,

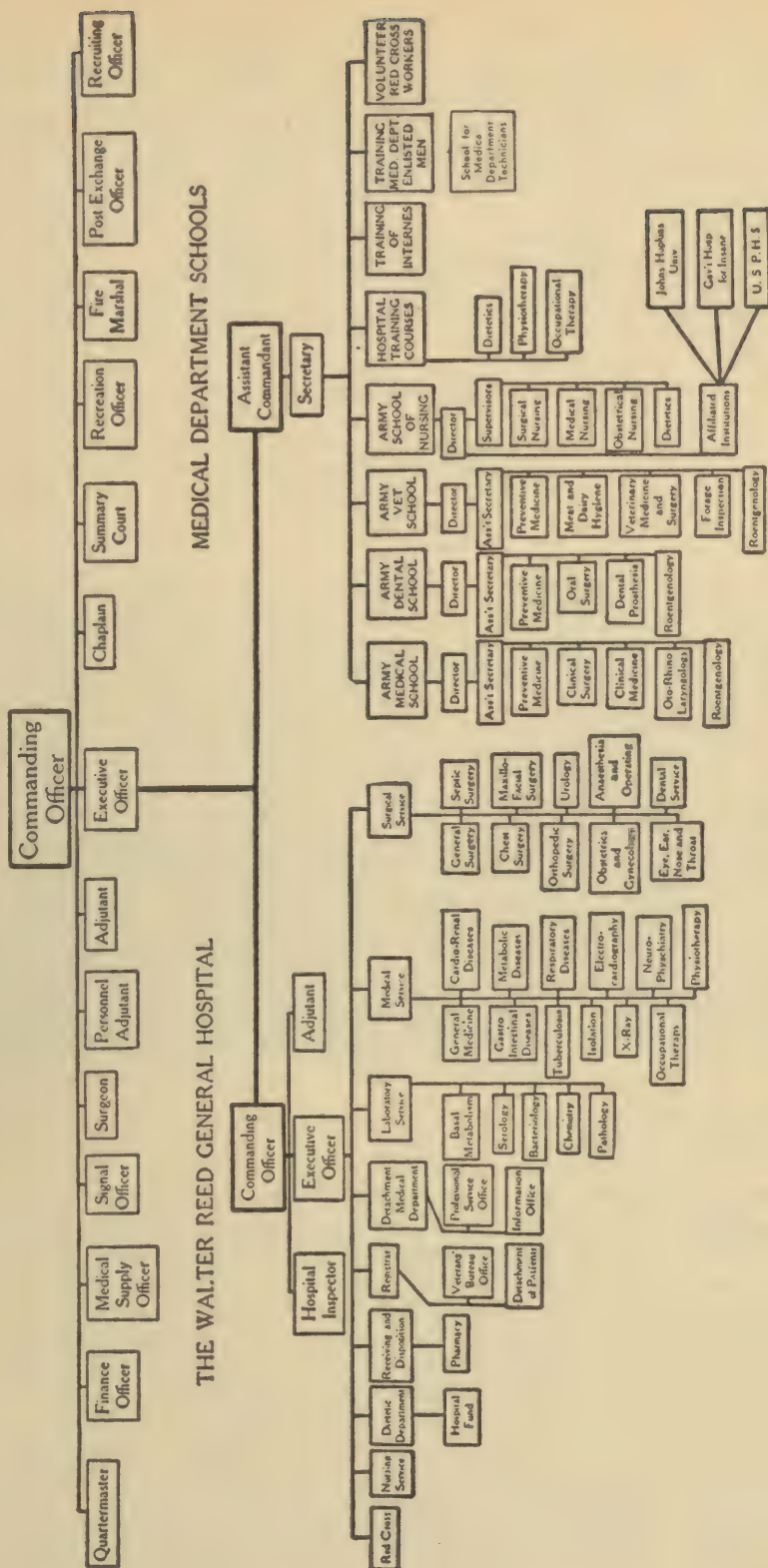


Plate 3. Organization of the Army Medical Center.

and the *Army Veterinary School*. These schools are conducted solely for the special training of Medical Department officers and enlisted men.

Regular courses are given for physicians, dentists, and veterinarians recently commissioned and *advanced courses* are given for officers of longer service. *Individual training* is available for those specializing in various branches of medicine, surgery, and public health.

Courses for Medical Department enlisted men include X-Ray and *laboratory technic*, *oral hygiene*, *dental mechanics*, and *food and forage inspection*.

Under direction of the schools, but conducted in the hospital itself, there are courses in dietetics and physical therapy. Selected Army Nurses are trained in the field of *anesthesia*.

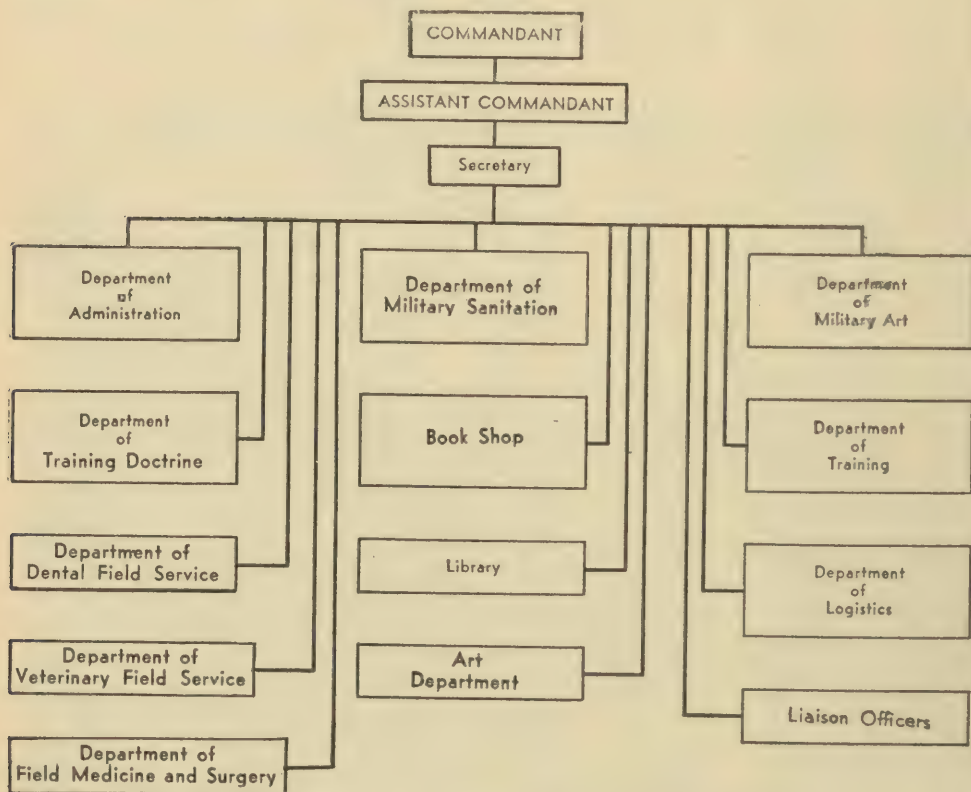


Plate 5. Organization of the Medical Field Service School.

The organization and command of the Medical Department Professional Service Schools are so established that separate faculties are provided for the Medical, Dental and Veterinary Schools. These schools are coordinated by the Assistant Commandant. Many of the officers on duty at the Walter Reed General Hospital are members of the faculty. The facilities of the hospital are available for the instruction of students of the school. An average of 75 officers during peace-time graduate yearly from the Medical Department Professional Service Schools. These Professional Service Schools also graduate annually approximately 50 enlisted men in roetgenology technic, 40 in clinical laboratory technic, 30 in dental mechanics and oral hygiene, and 10 in veterinary technic and food and forage inspection. All schools have increased in capacity during this emergency.

The Biological Laboratories. The biological laboratories, in addition to furnishing a valuable accessory to teaching for the Professional Service Schools, do routine laboratory work for the hospital, for the Third Service Command, and special work for the entire Army. They manufacture various biological products and supply typhoid vaccine for all

the federal medical services. The major research work of the Medical Department is conducted in these laboratories. They are equipped with the most modern sterilizers, incubators, and refrigerators to insure sterility and the preservation of biologicals which are essential to the military service. The biological production laboratory is prepared to meet the requirements of a maximum mobilization. The capacity of production is such that over 1,500,000 doses of typhoid vaccine can be made in one week. The laboratories collaborate with civilian and other federal laboratories in the field of research.

MEDICAL FIELD SERVICE SCHOOL

Purposes of the School. The purposes of the Medical Field Service School are: To instruct and train Medical Department officers of the Regular Army, National Guard, and of the Officers' Reserve Corps in the principles and methods of medical field service so as to increase their ability as instructors and to enhance their proficiency in the performance of their command and staff duties.

During periods of emergency, to instruct and train selected enlisted personnel of the Army of the United States for commission as officers of the Medical Administrative Corps, Army of the United States, and in the duties pertaining to the training and operation of Medical Department units of the components of the Army of the United States.



Plate 6. The Medical Field Service School, Carlisle Barracks, Pa.

To act as an agency of the Commanding General, Services of Supply, in the development and perfection of the principles and methods of medical field service.

To assist in the development of medical field sanitary equipment and the modification and development of field equipment pertinent to the needs of Medical Department troops and installations; to assist in the preparation and revision of Medical Department training publications, instruction manuals, and other publications; to make research in matters pertaining to the field duties of the Medical Department; to disseminate to the service information pertaining to instruction and training used and developed at the Medical Field Service School.

Location and History. In 1920, the War Department authorized the establishment of the Medical Field Service School at Carlisle Barracks Military Reservation as a means of providing field training for Medical Department officers and enlisted men. The school was established in 1921. Carlisle Barracks is just northeast of the city limits of Carlisle, Pennsylvania. One of the oldest American military posts, it was established by the British Army in 1754. It has been the scene of important events in wars fought by the United States from the American Revolution, during which it was a depot and munitions works, to the World War, when, during 1918-1919, it was used as General Hospital Number 31. From 1879 to 1918 it was occupied by the Carlisle Indian Industrial School. Since World

War I, Carlisle Barracks has remained under the control of the War Department. It is a Medical Department post with a medical officer in command.

Many of the buildings used for housing the school facilities until October 1941 were formerly used by the Carlisle Indian Industrial School. Some were constructed during the period of the Revolutionary War and other immediately following the Civil War. A new school building was opened to classes in October 1941 (see Plate 7). Additional buildings and facilities of the temporary type have been provided for the operation of an increased quota of Medical Department officers and Medical Administrative Corps officer candidates.

Command and Organization. The school has the same organization as the special service schools of the arms and other services. *The Commandant* commands the post and all of its troops and installations. *The Assistant Commandant*, a medical officer of the grade of colonel, supervises the conduct of the various courses and the administration of the school departments. In addition to the instructors of the school, the post overhead includes a number of officers and enlisted men of the Medical Department, Quartermaster Corps, Signal Corps and the Finance Department. A protestant and a catholic chaplain are present for duty. Commissioned personnel of the Infantry, the Corps of Engineers and the Judge Advocate General's Department are on duty at the post. The 32d Medical Battalion is the demonstration unit for the school.

School Departments. The Medical Field Service School has the following instructional departments: Administration, Military Sanitation, Field Medicine and Surgery, Military Art, Training, Logistics, Training Doctrines, Dental Field Service and Veterinary Field Service. Each instructional department is headed by a Director. In addition to the Medical Department officers of the faculty there is an Infantry officer, an Armored Force officer and a Chemical Warfare officer assigned as liaison officer and instructor. The faculty consists of especially trained officers, many of whom are graduates of the Command and General Staff School and of the Army War College.

The school has three activities which facilitate the instruction. The school Library where military and medical publications are available for instructors and students; the Art Department which prepares overlays, charts, diagrams, and allied instructional materials; and the Book Shop. These activities are under the supervision of the Assistant Commandant.

The instructional departments have specific objectives in reference to training and instruction:

Military Art (Medical Tactics and Technique). To instruct students in:

The practical application of map reading including aerial photographs and photomaps.

The principles of war, and the characteristics of the various combat arms.

The organization and employment of the combat arms.

The organization, equipment, tactics and technique of Medical Department units.

The technique of combat orders.

The principles of chemical warfare.

Military Sanitation. To instruct students in:

The established measures for the preservation of the health and prevention of disease among troops in all climates and under all conditions.

Responsibilities of the Medical Department in health matters and control measures against all diseases of military importance.

The construction and use of field sanitary devices.

Methods of conducting sanitary inspections.

Training. To instruct students in:

The more basic aspects of military training.

The methods of conducting military training for groups of enlisted men.

Dismounted drill and calisthenics for both physical fitness and knowledge of the manner of instructing in these subjects.

Military courtesy and discipline.

Training management, including programs and schedules.

Logistics. To instruct students in:

The principles and methods of supply of troops in the field.

The principles and methods of movement of troops of smaller units.

Administration. To instruct students in:

General administration of the military service.

Administration of the medical service.

General knowledge of military law and the administration of military justice.

Training Doctrine. (Extension Courses).

To prepare instructional material for use in the training of officers and enlisted men, particularly those of the Medical Department.

The preparation and revision of Field Manuals, Technical Manuals, Army Extension Courses, Army Regulations, Training Films and Film Strips.

The distribution of instructional material to troop schools of the various posts and stations of the Army.

Dental Field Service. To instruct students in:

The principles and technique of dental administration in post, camp and in the field.

The principles and technique of dental service in the field.

The proper treatment of maxillo-facial injuries in the field, and in the post or camp.

The role of the dental surgeon as assistant to the medical officer in the field.

Veterinary Field Service. To instruct students in:

Provisions made for the protection of troops against the use of unsound food products of animal origin.

Preparation and rendition of field veterinary reports and returns.

The principles of sanitation, preservation of animal health, prevention and control of diseases of animals.

The organization, technical and tactical employment of veterinary organizations with various arms.

The organization, installation and operation of veterinary field hospitalization.

Veterinary aspects of chemical warfare.

Training Courses. In time of peace there are several courses of instruction normally conducted by the school. These courses are so arranged that field training will be made available to the maximum number of Medical Department officers and enlisted men and for the specific needs of those who attend the school.

The *Basic Course* is designed for newly commissioned Regular officers of the Medical, Dental, Veterinary, and Administrative Corps of the Medical Department. This period of training is normally conducted each year for five months, commencing about January 15 and ending in June. It includes basic principles of field service, field sanitation, training management, and Medical Department administration.

The *Advanced Course* is for selected field officers of the Medical Department who receive three months of training in medical tactics and related subjects of large army units. This course normally begins about September 15 each year and ends in December. Many of the officers who complete this course are then assigned as instructors with the National Guard and Organized Reserve units.

The *National Guard and Organized Reserve Officers' Course* is a two-months Course, usually beginning about September 15 of each year and ending in November, for selected officers of the Medical Department from the National Guard and Organized Reserves.

The *Noncommissioned Officers' Course* begins about September 15 of each year and ends November 15. This two-months' course is designed for noncommissioned officers of the Medical Department of the Regular Army and the National Guard, to instruct them in their field duties and Medical Department administration.

Army *Extension Courses* are offered by the school to certain Regular and Reserve officers and enlisted men of the Medical Department whose duties will not permit them to attend the School.

A *Medical Reserve Officers' Training Corps* camp is conducted for a period of six weeks during the months of June and July each summer at Carlisle Barracks.

The *Officers' Reserve Corps* of the Medical Department has two 14 day training

periods, one during the month of June and the other during the month of July of each year.

Attendance at Courses. The average attendance at these various periods of instruction is as follows:

The Basic Course	60 to 80
The Advanced Course	15 to 25
The National Guard and Organized Reserve Course	10 to 20
The Noncommissioned Officers' Course	75 to 100
The Enlisted Sanitary Technicians' Course	15 to 25
The Reserve Officers' Training Corps Camp	250 to 500
The Officers' Reserve Corps Camps	500 to 600

The average total of the above indicates that about 1000 officers and enlisted men of the Medical Department, including the National Guard and the Organized Reserves, are actively trained in medical field service annually.

Special Courses Instituted in 1940-41. The emergency conditions of 1940-41 resulted in the prompt expansion of the facilities of the Medical Field Service School to meet the enormously expanded responsibilities of the Medical Department. A course of one month was instituted for the training of officers of each component of the Medical Department of the Army of the United States. Similarly a one-month's course for Sanitary Technicians was instituted. An officer-candidate course for prospective appointees in the Medical Administrative Corps was started. Students are provided living quarters in newly-constructed frame barracks. The first officers' class of one month which started April 1, 1941, was drawn from units of the field forces, for the most part, and subsequent classes have been from the same source.

Demonstration Troops. Troops of Medical Department personnel are stationed at Carlisle Barracks to conduct demonstrations and assist in teaching the tactics of medical field service. The presence of these troops provides an excellent opportunity for the students to assume command during school maneuvers and field exercises.

The Medical Department Equipment Laboratory. The Medical Department Equipment Laboratory was established on October 1, 1920, for the purpose of providing an experimental laboratory for producing, testing, and determining the serviceability of medical equipment, especially the equipment used by field units. It has developed many of the appliances and apparatus used by the Medical Department of the Army, and new models of equipment, transportation, and other devices are being studied constantly. This activity functions under a Director, who is a Medical officer.

The Department of Field Medicine and Surgery. The Primary purpose of this department is to improve upon the methods of handling the wounded, particularly at the time and place the casualty occurs. It also makes studies in the advancement of industrial medicine, such as cause of accidents and the necessary treatment.

The Medical Department Board. The Medical Department Board is stationed at Carlisle Barracks and operates under the direction of the Surgeon General. It consists of the Commandant and Assistant Commandant of the Medical Field Service School and from three to seven officers recommended by the Surgeon General and designated by War Department order. The Board considers and reports on such subjects as may be referred to it. It originates and submits to the Surgeon General recommendations for the improvement of the Medical Department, especially policies relating to service in the field.

The Medical Field Service School Library. The library at the Medical Field Service School possesses a noteworthy collection of books, magazines, and documents for the use of faculty members, students, and members of the garrison.

The Medical Field Service School Book Shop. The Book Shop is one of the essential activities of the Medical Field Service School. It is an agency through which all Army personnel may purchase text books, and instructional matter as needed in their training activities. A list of publications available will be furnished upon request.

THE ARMY MEDICAL LIBRARY

The Army Medical Library is a treasure house of classified medical information available to students of medicine throughout the world. It is the most precious possession of the Medical Department of the United States Army, and as expressed by Professor William H. Welch of Johns Hopkins School of Medicine "America's greatest gift to Medicine." It contains more than a million items and is the largest medical library in the world.

History. Until 1922 the Army Medical Library was called the Library of the Surgeon General's Office. It was originally a small collection of reference books for the use of Surgeon General Joseph Lovell (1818-1836) and was kept in his office in Washington. In 1840 a manuscript catalogue listed 228 volumes; at the outbreak of the Civil War in 1861 the number of volumes was between three and four hundred; on May 10, 1864, a printed catalogue showed a total of 1,365 volumes; and in another printed catalogue of October, 1865, the number had increased to 2,258. Colonel John Shaw Billings, Medical Corps, is given credit for being the creator of the library. He was placed on duty in the Surgeon General's Office in 1865, and he took a deep personal interest in the establishment of a source of medical information for Medical Department officers. He was the librarian from 1868-1895. In 1868, \$80,000 was made available from funds left over from the Civil War hospitals, and Colonel Billings was given authority to expand the library.

On June 12, 1868, a printed catalogue showed 6,066 volumes; in 1871 the number had doubled to 13,380; in 1873, 25,000 volumes and 15,000 separate pamphlets; in 1876, 40,000 volumes and 40,000 pamphlets; and in 1895, when Colonel Billings retired, the number had increased to 308,445. At the present time the Army Medical Library contains over a million books, pamphlets, theses and manuscripts. Many rare books are in the collection, including 450 of the existing 600 medical *incunabula* or books published before A. D. 1500. Besides books, pamphlets, and these valuable collections, the library has five thousand portraits of medical men, and a collection of medical autographs.

Location. The Army Medical Museum, which housed the Army Medical Library from 1865 to 1887, occupied the Old Ford's Theatre, Washington, D. C., in which Abraham Lincoln was assassinated. In 1887, the Army Medical Library and the Army Medical Museum were moved to larger quarters at the corner of Seventh Street and "B" Street (now Independence Avenue), S. W., Washington, D. C. It still remains at this site. A bill was passed by Congress and approved by the President June 15, 1938 authorizing \$3,750,000 for the construction of a building to replace the present Army Medical Library and Museum. Funds for this appropriation were never made available. However, during 1941 Congress passed a bill (H. R. 5146) authorizing an appropriation of \$4,750,000 for construction of a new Army Medical Museum and Library and for purchase of the site in the District of Columbia. It will be a building approximately 212 feet square, containing 4,002,000 cubic feet of space. It is expected that the site will be near the Capitol.

The Index-Catalogue. The Index-Catalogue began in the mind of Colonel John Shaw Billings when from his experience in 1860 he realized the need for such a bibliography. The catalogues published in 1872 and 1873 led to definite proposals in 1876, when a catalogue was submitted to universities, libraries, and medical men for criticism and suggestions. The catalogue was received with high favor. It was arranged under both authors and subjects, practically the same style as adopted later in the Index-Catalogue. The *first series* of the Index-Catalogue was published in 1880, when Congress made the first appropriation for this purpose. It indexed 85,663 author titles, 151,504 titles of pamphlets, subject titles of 168,587 books, and 511,112 journal titles. Sixteen volumes came out yearly from 1860 through 1895. The *second series* consisting of 21 volumes was issued between 1896 and 1916. The *third series* consisting of ten volumes and indexed medical literature to include the year 1925, was compiled between the years of 1918 and 1932. The *fourth series* is now under compilation, the first volume of which was issued in June, 1936. The abbreviations are shortened; the volume numbers are in Arabic instead of Roman; and the use of eponymous titles in nomenclature of diseases is avoided as much as possible.

The Index-Medicus. The history of the Index-Medicus is herewith included because it has so often been confused with the Index-Catalogue with which it was closely related as an immediate supplement for a long period. It has never been an official government periodical and depended upon financial support from its sales. Starting in January, 1879, a year before the first volume of the Index-Catalogue appeared, it came out monthly until May 1899, when it met financial ruin. Three more volumes were published between 1900 and 1902 in Paris under the title *Bibliographia Medica*. In 1903 the Carnegie Institution of Washington with Colonel John Shaw Billings as vice-chairman of the Board of Trustees revived the Index-Medicus and it continued until 1927, when it was amalgamated with the "Quarterly Cumulative Index Medicus" of the American Medical Association, both of which are continuing to give their support. Although the Army Medical Library continues to assist in the compilation of necessary literary facts, the Army gives no financial support to the publication.

The Army Medical Library Centenary. On the 16th of November, 1936, the 100th anniversary of the founding of the Army Medical Library was commemorated at the Army Medical Library, Washington, D. C. Men whose names are known to every student of medicine came from distant parts of the world to celebrate an important advance in medical knowledge. Universities, scientific institutes, academies, hospitals, and libraries sent representatives. It was an important and significant occasion to commend the United States Army Medical Department for the most extensive collection of publications in the realm of medical science that mankind has ever known. The Army Medical Library and its Index-Catalogue is according to an editorial in the Journal of the American Medical Association, the "Pride of the Medical Profession of America."

THE ARMY MEDICAL MUSEUM

History and Origin. The Army Medical Museum had its origin in 1862 during the Civil War. It was originally created for the purpose of preserving specimens which would be illustrative of war wounds and of war diseases which produced death and disability. Most of the early collections came from the battlefields of the Civil War. Gradually the collection was extended to include all forms of injuries and disease, and at the present time it is a general pathologic museum accessible to scientists and research workers for study. It also is an educational exhibit for the public.

Organization and Location. The Army Medical Museum is a part of the Professional Service Division of the Surgeon General's Office. It is housed in a large three-story building with the Army Medical Library at Seventh Street and Independence Avenue, S. W., Washington, D. C. This building was completed in 1887 at a cost of \$200,000. The Army Medical Library and the Army Medical Museum have made such a rapid growth that recent construction authorization has been granted for a new and adequate building.

Purpose of the Army Medical Museum. It is the central laboratory of pathology for the Army and the national museum of the American Dental Association. Under the auspices of the National Research Council and the American Medical Association, it is the depository of the American Registry of Pathology.

Contents of the Army Medical Museum. The total number of accessions is over 125,000 of which about 40,000 consist of medals, figures, photomicrographs, and actual tissue dissections of embryology, normal anatomy, histology, pathology, history of medicine, dentistry, and veterinary medicine. In May, 1939, one of the largest and most valuable collections of wax anatomical specimens in the world was added to the Army Medical Museum. (This was the George S. Huntington collection, presented to the Army Medical Department by Columbia University Medical School.)

Some of the other outstanding exhibits are the medical medals, the section on ophthalmic pathology, the section on fracture of bones, the famous microscope collection, and the world's largest collection of war wounds, showing the effects of arrows, tomahawks, small arms, high explosive shells, and war cases.

This museum is an important and valuable adjunct to the Army Medical Library and like the library is an educational treasure whose value is appreciated as much by the professional public as by the Army Medical Department.

CHAPTER III

FIELD SANITATION

Definition. Sanitation is the art by which we adjust our living conditions in accordance with the laws of hygiene. Methods of application of sanitary art may change—the simplest effective methods are the best. Sanitation as applied to the military is shaped according to the environment in which the military situation occurs. In this chapter emphasis is placed on the sanitation of the forces in the field and in camps rather than in peacetime garrisons. Because of the advancement of preventive medicine and sanitary engineering, sanitation in garrisons has become similar to the public health control of large metropolitan communities.

In the military force the art of sanitation is founded upon a knowledge of hygiene. Commanders of troops who have a clear understanding of the fundamental hygienic principles may intelligently select and apply the sanitary methods required to meet the needs of their troops under various conditions. Field sanitation employs all the sanitary methods used in civilian communities and, in addition, those special methods found necessary to preserve the health of troops living under conditions peculiar to military service. Sanitation is closely related and basic to preventive medicine. Preventive medicine as related to military forces is discussed in Chapter IV. There is necessarily some inclusion and reference to disease in the discussion of sanitation—field sanitation has a large part in prevention of disease.

Purpose. When troops take to the field they leave behind all the comforts and appliances of modern civilization, the shelter over their heads, beds to sleep in, safe drinking water from a handy faucet, cooking ranges, toilets and bath tubs, in a word all that is accepted so naturally without thought in our daily life at home. And yet these things are necessary and must be provided. (FM 8-40). Impure water cannot be used; human excreta, manure, and garbage must be disposed of in an efficient and sanitary manner; clothing infested with parasites must be sterilized; food must be preserved from flies and other insects; and bathing, laundry, and toilet facilities must be provided.

Responsibility. Who shall be the judge as to what water is safe for human consumption and advise as to its method of sterilization? Who is called upon to recommend as to sanitary requirements in the selection of a camp site? Who advises and instructs regarding the disposal of camp wastes? Who, in short, must know the right thing to do and how to do it? It is obviously not the duty of the line officer. He is skilled in warfare, and it is his duty to engage with the enemy in armed conflict. While he is responsible for the entire administration of his command he is forced to depend on his staff of trained officers for technical advice and assistance. Upon the *medical officer* then must fall the responsibility of advising as to these sanitary measures and appliances.

And yet, the average doctor, trained though he be in the practice of medicine and surgery, is wholly incapable of advising on these important matters. It is obvious, therefore, that the exigencies of military life require a type of training that is not ordinarily acquired by medical practitioners. In other words, in warfare and field service, medical men are needed who are trained in military matters and military hygiene and sanitation. The average doctor, though he be in uniform and though he be skilled in the arts of medicine and surgery, may be of little assistance to his commanding officer and to the military service if he is ignorant of these other matters. Remember that in no war in history have deaths in battle equaled the number of deaths caused by disease. When to this is added the acknowledged fact that most diseases are preventable, the importance of military hygiene, sanitation, and preventive medicine may be appreciated.

Historical Background. Camp sanitation plays no little part in the prevention of disease. During the Spanish-American War the importance of pure water, the danger from flies and other insect carriers, and the proper disposal of camp wastes were not sufficiently appreciated by all. As a consequence typhoid fever ran rampant, incapacitating thousands of men before they ever reached the battlefield. Human excrement was disposed of in pit

latrines and then covered with lime. It was not, however, adequately protected from flies nor was the food that the men ate. It was no unusual experience in those days for men to notice and to complain of particles of lime on their food that had been deposited there by flies directly from the latrines. Commanding officers and soldiers failed to appreciate the dangers of impure water, especially in the tropics, and were sometimes careless about what they drank, so that dysentery was widespread. In fairness, however, it must be said that this was not due wholly or even largely to indifference to the dangers, but rather to the difficulties encountered in campaign conditions and to a lack of knowledge of and facilities for the purification of water in the field by methods which we now have.

Responsibility of Line Officers. From time immemorial, it has been held that the commanding officer of any military organization, regardless of its strength or type, is responsible in all respects for that organization. He is, therefore, responsible for the health of the members of his command and, consequently, for the initiation and enforcement of suitable measures that will most effectively protect their health. To handle a military force in battle is much less difficult than to bring it on to the field in good condition. The maintenance of the health of his soldiers, and, consequently, the military power of his organization, is one of the highest duties of a commander.

Cooperation of Line with Medical Officers. The advice of the medical officer is invaluable in the conservation of the health of troops, and the commanding officer will lean heavily upon his surgeon in all matters pertaining to the health of his men. The commander realizes that rigid sanitation is the tool by which health is maintained. Usually, the recommendations of the experienced medical officer are accepted without question and are carried out just as fully and as promptly as possible. All the reasonable recommendations of a medical officer will be given the gravest consideration by the commander concerned.

Experienced officers have long recognized that for the preservation of the health of their troops—and thereby their effective strength—sanitary requirements are exceeded only by military necessity, and that the military necessity which must disregard sanitary requirements exists very seldom and then only when in actual contact with an enemy.

MARCHES

The Soldier's Load. When a soldier goes into the field he must carry on his own back the equipment and clothing that he requires. In the selection of the materials entering into this equipment, the weight of the load, and its distribution on the body of the soldier, the medical man plays an important advisory part. An overloaded soldier either arrives too late on the scene of the fighting, throws away excess equipment, or else arrives too exhausted to fight.

The proper load for an infantryman is one that does not exceed $\frac{1}{3}$ the body weight or about 50 pounds for the average man. The maximum load is 45 per cent of the body weight or 67 pounds for a 150 pound man. Above 45 per cent the average expenditure of energy increases three times as rapidly as the load.

The load should be so adjusted that it is as near as possible to the center of gravity of the body. The nearer it is to this point the less muscular exertion is required to maintain equilibrium. The center of gravity of the body in the erect position is 0.6 cm. in front of a line connecting the centers of the femoral heads and opposite the center of the body of the third lumbar vertebra.

There should be no constriction of the chest. Pressure on the chest not only causes an increased expenditure in an effort to breathe, but also causes the heart severe embarrassment by the force required to expel the supplemental air against the increased intrathoracic pressure.

Constriction of the abdomen restricts its expansion and thus lessens the excursion of the diaphragm. This embarrasses respiration and further prevents the abdomen from serving as an expansible reservoir of blood, throwing an added strain on the heart. All load should be borne by the shoulders and back and should fall mainly on the trapezius muscles rather than on the clavicles or acromion processes.

Marching. Marching constitutes the principal occupation of troops in campaign and is one of the heaviest causes of loss. The importance of the ability to march and thus secure preponderance of numbers at the critical time and place for victory has always been recognized by the great strategists. And yet there is no secret in the ability to make successful marches beyond the secret of attention to detail and the observance of the rules of the game. In this the conscientious medical officer has an important part.

Preparation for a March. Troops should be trained to march by a graduated scale of work, exactly as athletes must gradually develop their endurance and skill. Medical officers should insist that a regular program be followed, commencing with exercises and drill, followed by marching without packs and short marches with light packs, gradually increasing the size of the pack and length of the march until the men are able to march 15 miles a day under full pack without exhaustion.

The success or failure of a campaign may depend on the attention to detail by medical and line officers. Except when provided with rail or motor transportation, the motive power of the soldier is in his legs and feet. No soldier can march with bad feet and no one can afford to neglect his feet. The attention to the feet begins with the selection and fitting of proper shoes, the kind and fit of socks, the proper cutting of toe nails and the care of the skin, and ends with the rigid inspection and care of the feet at the end of each day's march. Only in this way will the feet be able to withstand the gruelling punishment of long marches on rough roads under a heavy pack. In Chapter V, shoe and sock fitting is discussed and rules are given for the care of the feet. It is desired here only to emphasize their importance.



Plate 1. Full Equipment Adjusted to the Infantry Soldier.

Before starting on a march the men should be inspected as to their general state of health and the obviously ill separated out. The adjustment of the pack is carefully noted. A detailed foot and foot-wear inspection is made, and all defects are corrected before the march is begun.

Conduct of the March. Marches should be conducted during the most temperate part of the day, in the cool of the morning or the afternoon, preferably the former. Morning marches should begin about one hour after daylight, thus affording ample opportunity after arising to eat breakfast, break camp, adjust packs, police camp, and attend to the calls of nature. Breakfast should be a light one and include fuel-supplying foods such as sugar and fat.

Night marches are more trying than day marches and generally should be shorter. They should begin soon after dark and end if possible by 1:00 A.M. or 2:00 P.M. to allow the troops to sleep during the early morning hours. Tactical considerations, however, often require the march to be so timed as to assure the arrival of the troops for assault at daybreak.

It is very important that canteens be filled with potable water at the start. Frequently soldiers fail to do this and, becoming thirsty on the march, take whatever water is available from surface sources, which are usually unsafe. This is particularly true in hot tropical countries where unless water discipline is strict, soldiers are apt to drink from pools and streams, all of which are dangerously polluted.

Water cans and trailers are filled and chlorinated at the commencement of the march.

Troops should march at once after falling in. It is both tiring and injurious to morale to stand around under full pack waiting to move out.

Experience is an important guide in all these matters. March technic that would be successful in a temperate climate utterly fails in arid deserts or in tropical jungles. This is one reason why all officers are required to have a broad experience and are sent to foreign duty in tropical lands. In jungle hiking the vegetation is so dense that, unless a column is kept compactly closed up and a responsible officer is stationed at the rear who keeps in constant touch with the leader, soldiers will stray and at once become hopelessly lost. More than one command has dissolved in the dense tangles of a tropical jungle, never to be reassembled. On account of the heavy rains, the sudden incidence of darkness when the sun sets, and the necessity to pitch camp in a wet and impenetrable forest, the march is usually terminated not later than 2:00 P.M., after a very early start, and tents pitched or fern shacks constructed in the early afternoon. Troops can then get under cover and change to dry clothing from waterproof bags; otherwise the command rapidly becomes exhausted from exposure and improper camp conditions.

The *rate of march* is $2\frac{1}{4}$ to $2\frac{1}{2}$ miles per hour, including the hourly halts.

The *halts* for rest are made at regular intervals. The first halt is for 15 minutes at the end of the first 45 minutes of marching for the purpose of allowing troops to relieve themselves and to adjust packs. Thereafter there are halts of 10 minutes after each 50 minutes of marching. A halt of from 30 minutes to an hour is usually made at the "noon halt," during which a light meal may be eaten. During the halts the men should always take off their packs. If the ground is not wet they should lie down. If the ground is covered with snow, men must avoid sitting down on the snow and if nothing else is available to sit on they should remove their packs and sit on them.

The *distance* averaged by foot troops per day is 12 miles for large commands and 15 for small ones. Anything more than this is called a "forced march." Greater distances are covered not by increasing the rate of march but by extending the time of the march.

Physical inspection of the troops should be made by company officers and surgeons during the march to note men who give evidence of fatigue. If these men are cared for early they may be prevented from becoming march casualties and saved to the command. Special attention should be given to the complaints about foot affections.

The men march in a column of twos, threes or fours at route step. Advantage should be taken of paths and shade along the route. Hard pavements should be avoided when dry dirt roads are available and foot troops should, when practicable, be marched on separate roads from mounted troops, artillery, and transport. Men should be allowed to unbutton their collars and shirts. In summer the sleeves may be rolled up. Such simple precautions often save men from heat exhaustion. The order of march in the platoon should be alternated each day, giving the short men as well as the tall men an opportunity to lead the column.

Troops should be halted well clear of their camp to come up slowly and be somewhat cooled off and rested when arriving in camp.

Water Discipline. Water discipline is essential. Raw recruits are inclined to empty canteens soon after the start of a march and then drink surface water that may be highly polluted. Slow sipping economizes water and quenches thirst better than large gulps.

Sucking a small pebble or chewing gum is valuable because the mouth is kept closed and the flow of saliva is increased. The desire for water is decreased.

The normal needs of water average about one quart of water at the end of 7½ miles marched under average conditions. This may be increased or decreased depending upon any factor that increases or decreases body heat.

The amount of water evaporated during a given march with the effects if not replaced are as follows:

TABLE, WATER EVAPORATION ON THE MARCH

<i>Miles Marched</i>	<i>Quarts Evaporated</i>	<i>Effects if loss is not replaced</i>
7½	1	Thirst
15	2	Slight inefficiency
22	3	Marked inefficiency
30	4	Danger

Water supply on the march is maintained in several ways. The normal routine of providing potable water consists of:

Overnight sterilization. Fill canteens and trailers so that by morning the water is cold, or chlorinated water is free from taste. If water is sterilized by boiling, it is better made into weak tea.

At start in morning. All canteens and carts should be full of cool, sterile water.

At half-way halt. Canteens should be refilled from water carts, strict care being taken to avoid waste. Water carts should be refilled at once, if possible, and contents chlorinated.

At end of march. Advance arrangements should be made as to the water supply by the following officers:

Medical officers are responsible for the purity of water from main sources.

Engineers are responsible for the quantity and delivery of water.

Unit commanders are responsible for water guards and distribution of water.

Water supplies are rigidly protected, a responsibility that is shared by all officers. Streams are marked showing filling point for water for cooking and drinking, next down stream a place for watering animals, and, below this, places for bathing and for washing clothing, respectively. A patrol is put on the stream to enforce these regulations. Guards are placed over important springs and wells.

The high temperature and humidity of the tropics cause a tremendous amount of sweating, and this sweating results in a loss of salt from the body. This may produce severe abdominal cramps called "heat cramps" or by soldiers "salt cramps." To prevent this condition salt must be added to the water. It also happens that many of the sources of water supply in the desert furnish water with a relatively high degree of salinity. Troops must become accustomed to drinking water with salt in it. Salt should be added to water supplies in the following amounts to be effective:

- (1) One lb. table salt to 100 gallons of water.
- (2) 0.3 lbs. table salt to 36 gallons of water (Lyster bag).
- (3) ¼ teaspoonful to one quart of water (metal canteen).

Prior to arrival at camp medical officers with some of their personnel should go forward with the advance party to supervise the sanitary arrangements which should be prepared for the troops on their arrival, such as latrines, urinals, water supply, kitchen waste disposal, infirmary, and similar medical matters. On arrival, units are assigned their company areas, packs unslung, tents pitched, orders read, inspection of feet made, and sick call held. Men are allowed to rest. When possible it is well to avoid making camp after dark. Troops should never be kept standing in ranks after arrival at the camp site but should be immediately sent to the areas assigned them. A substantial hot meal should be served promptly at the end of the march. Commanders must personally see that their men wash their feet as soon as possible after reaching camp and that their feet are treated as required. Details of the care of the feet are related in Chapter V. Material requirements necessary for change of socks and shoes must be provided the troops before the march.

Duties of the Medical Officer. The duties of a medical officer of a unit on the march are best accomplished if he will keep towards the rear where he can gauge the men's fitness, observe the effects of the march on both the strong and the weak, and treat soldiers who have been referred to him by the unit commander. Sick men will be evacuated or placed at collecting points previously coordinated with the evacuation system.

Toward the end of the march he should request to have the necessary sanitary personnel join the advance guard to supervise the water purification and other sanitary arrangements for the camp site before the main body arrives.

During the longer halts the medical officer can make closer inspection of the individual men who have complaints, and by inquiry of several members of the unit can estimate the general physical condition of the force.

The medical officer should keep himself acquainted with the policies and plans of the unit commander so that the medical and sanitary arrangements can be outlined and established to conform to and satisfy this plan. The ambitious medical officer who shows keen interest in the welfare of the troops will soon gain their confidence and do much to stimulate and maintain morale.

CAMPS AND CAMP SITES

The careful selection of a camp site is most important. The medical officer is frequently asked to advise as to the suitability of a camp, and it is incumbent on him to know how to survey sites available for a camp and advise intelligently on its selection and preparation.

Strategical and tactical requirements usually dictate the choice of camp sites, and under such circumstances sanitary considerations alone will not be the governing factor. Within these limitations, however, the most favorable site from a sanitary point of view should be selected.

Kinds of Camps. Camps are of various kinds. Temporary camps are those that are used from one night to six months. They vary from the bivouac which is a one-night camp on the march or in active service confronting the enemy and in which the shelter or "pup" tent is used, to more durable camps with heavy tentage. Permanent or semi-permanent camps are used for a period longer than six months. They may consist of mobilization or training camps where troops are assembled and trained, embarkation or debarkation camps near sea ports for the embarkation or reception of troops, and segregation camps for the quarantining of troops for contagious diseases, including venereal diseases:

Sanitary Survey of Proposed Camp Sites. A sanitary survey should be made of the proposed sites bearing in mind the following considerations:

The character of the site and the surrounding territory, the natural drainage, and the nature of the subsoil should be noted.

The methods of waste disposal should be studied.

The water supply should be investigated as to its adequacy and potability.

The types of habitation required should be borne in mind—usually this will be tentage supplied by the troops themselves.

The presence of insects and the character of the vegetation are important. Have an eye for insect vectors of disease and poisonous plants dangerous to man and animals.

The presence of communicable diseases in the surrounding territory may be of great importance and tend to forbid the establishment of a camp in that vicinity.

A Suitable Camp Site. Following are the requirements of a suitable camp site:

The available space should be large enough to accommodate the command without crowding, allowing ground for erection of all necessary tentage and depots with an area for exercise and training.

Camp on a sloping ground is preferable to that on flat ground. This gives positive drainage and insures against stagnant surface water. It is not necessary to place it on the top of a hill.

Firm, porous soil covered with grass is the most desirable. This insures against excessive mud in wet weather, and dust in dry weather. Ground water is usually lower in

such soil, affording better opportunities for disposal of waste water by seepage. There is also less apt to be surface water in such soil.

There should be no marshes, stagnant pools, or ponds in the neighborhood which might be the breeding sites for mosquitoes.

Water supply should be sufficient in quantity and of such quality as will permit purification with the available means.

Wood, grass, and forage should be easily obtainable.

The camp site should be accessible from the main routes of transportation but not necessarily astride of roads on account of the excessive dust and disturbance.

In cold countries ground sloping to the south, with woods to shut off the north winds, should be chosen.

In hot countries, the ground should be high, free from underbrush, and shaded with trees. Prevailing winds from one direction are desirable. Such winds aid in keeping insects away, especially flies, from the latrines and picket lines, and afford an opportunity of putting such establishments to the leeward. Violent winds are **undesirable** on account of the cold in the winter and the dust in the summer. Shelter from such winds is offered by leeward slopes and by woods.

Woods frequently are chosen for camp sites since they offer concealment from the enemy. Open woods without underbrush are ideal, but very dense forest is poorly sunned and is usually very damp and poorly ventilated.

Undesirable Camp Sites. The sites of old camps and the vicinities of cemeteries should be avoided. Marshy ground, ground near the foothills of a range with damp subsoil, plowed ground, depressions, closed ravines, dry beds of streams, thick forests, and insect-infested areas are all undesirable.

The presence of *disease-bearing insects* may be of utmost importance. The very tenability of a situation may rest on this factor alone, and it may become an important factor in the defense of a region. For instance, in the tropics, if a hostile and invading force could be held for some days in a heavily malarious region while the defending forces occupied higher, healthy ground, the entire campaign might be decided by this factor alone. Where disease-carrying insects prevail in great numbers all war plans have to take serious account of such a condition. Some of the most difficult problems that faced the defending forces in the Philippines had to do with the control of mosquitoes in dangerously malarious but strategically important areas.

Interior Arrangement of Camp. The interior arrangement of the camp must conform to the site chosen. For most purpose the camp area will usually be approximately square. The kitchens should be on the windward flank (if there is one), the latrines being on the opposite flank with the company tents between.

All tents should be individually ditched, especially if they are not provided with floors. Side walls should be rolled on all good days to allow sunlight and ventilation of the tent. Bedding should be aired and sunned frequently and systematically. In cold weather tents are heated with the conical Sibley stoves set in sand boxes.

Breaking Camp. Upon breaking camp it should be well policed. This is the responsibility of the commanding officer, but medical officers hold an advisory responsibility. All latrines should be well filled in and marked with a sign post, if the military situation permits, to warn future campers, refuse should be disposed of, and in general the ground left as nearly as possible in the condition in which it was found or better. There are many instances where subordinate units have been sent back to police a camp site which was left in an insanitary condition.

WATER SUPPLY AND FIELD PURIFICATION

Importance of Pure Water. The importance of pure water cannot be over-emphasized. Until the method of spread of intestinal diseases was understood and the part that water played in the conveyance of these diseases recognized, they were the largest cause of morbidity and sickness in the armies of the world.

Potable (Safe) Water. Pure water is, of course, the quality of water desired but seldom found. Pollution or contamination of water with human or animal wastes is common

in most sources of water found in the field. This means that disease producing bacteria or organisms which may be found in the water are the causative agents of the various intestinal diseases. Other bacteria found in polluted waters are those non-pathogenic bacteria common to the intestinal tract of animals and man.

Contrary to popular impression, it is not possible to determine, by simply looking at it, whether or not a particular water supply is safe for drinking in its natural state. The cool, sparkling water from the clearest spring may be laden with disease producing germs. On the other hand the water from a muddy or discolored stream may be suitable to drink in its raw state. The only safe method of dealing with water from an unknown source is to assume it to be dangerous until it is proven otherwise. Even water from a community's public water supply system cannot be taken for granted as being a safe water just because it happens to be from a public supply system. The safety of such a water can be quickly and easily ascertained, and such action should be taken before it is pronounced safe for troops.

However, potable water does not merely mean water which is not polluted. There are other factors which render water unpleasant to sight and taste. Turbidity is that characteristic of water found in its natural state which gives it a muddy or cloudy appearance. This is due to suspended material in the water, silt, clay and organic matter. Color in water gives an objectionable appearance. From the standpoint of the individual soldier unpleasant tastes and odors in the water make it unfit for drinking. All these detrimental qualities and their removal must be considered in supplying water to troops.



Plate 2. The Clear, Sparkling Water of a Spring May be Polluted by Waste from a Privy.

Sources of Water. The common sources of water are rivers and streams, lakes, wells, springs, tube borings, and distillation.

Water from rivers and streams cannot be considered safe and is usually turbid.

Lakes, if large, are usually clean in the center. The action of the sun and of oxygen purifies the water far from the shore. Shore water is never safe.

Spring water is of two kinds, namely land and main springs. Land springs are formed by water that percolates through the ground and appears at lower levels. It may be heavily contaminated. Main springs are derived from underground reservoirs lying

between two impermeable strata. Such water has usually been filtered through a considerable depth of soil and is usually, but not necessarily, free of disease-producing germs. All such water of course contains soil bacteria. It cannot be considered as safe for human consumption without proper treatment.

Well water is subsurface water and not necessarily safe just because it is not on the surface. Shallow wells may drain the surface almost directly and deeper wells in the vicinity of privies and barnyards may, in porous soil, be heavily contaminated. No well water should be accepted as safe until it has been proven so bacteriologically. To be safe, wells should penetrate through an impermeable stratum, be lined so as to exclude surface drainage, covered to prevent surface contamination, and equipped with pumps, etc. so that nothing is introduced, such as buckets, from the outside.

Artesian water obtained by tube borings is usually safe. Such water comes from underground supplies, formed by water draining from hills underneath impermeable strata of soil. It is best obtained in valleys and at the lowest points of plains.

Distilled water is bacteriologically pure but is not obtainable in sufficient quantities.

Responsibility for Water Supplies. In the Army, the Corps of Engineers is responsible for the quantity and quality of all water supplies not only in times of peace, but also in the Zone of the Interior and the Theatre of Operations in times of war. In the field all the general units and the water supply battalion of the Corps of Engineers have portable or mobile equipment for the purification of water and are responsible for supplying such water to the organizations to which they are attached. In certain instances it may be necessary for small units below the division to provide their own water supply. The Medical Department is responsible for determining the potability of, and advising as to the sanitary suitability of all water supplies for military personnel at all times and places. The unit commander is responsible for the water discipline of his organization and for the execution of standing orders pertaining to the purification of water by and within his own organization.

Water Requirements. All living things require water. Experience has shown that the minimum amount of water that must be provided for troops under ordinary conditions of march or in bivouac is 1 gallon per man per day, $1\frac{1}{2}$ quarts for drinking and $2\frac{1}{2}$ quarts for cooking and drinking with meals, either as water, as coffee, or other beverage. However, climatic conditions and the effort of march may alter this minimum. Troops operating in hot climates may require from 14 to 40 percent more water.

Let us suppose that the commanding officer of a body of troops desires to move camp to another location. He is anxious to know how much water will be required per man per day during the march and in the new location. The medical officer is asked to estimate these requirements and to advise on the plan. What then are the water requirements in the various situations, in permanent camps, in semipermanent camps, on the march, or in bivouac? The following will serve as a guide in this estimation.

Permanent camps: One should estimate a per capita consumption of 100 to 150 gallons per day where there is a water-borne sewerage system and where there are numerous other water requiring devices such as continuously flushing urinals, increased laundry facilities, dishwashing machines and lawns.

Temporary camps: One should estimate 5 gallons per person per day and 10 gallons per animal. This amount should not be greatly exceeded since waste water must be disposed of by improvised methods and an excess will collect as insanitary surface water.

Bivouac and march: Three gallons per capita are necessary, except under unusual conditions when 1 gallon is the absolute minimum. This is based on $1\frac{1}{2}$ gallons for drinking and cooking, $\frac{3}{4}$ gallon for washing hands and face, $\frac{1}{2}$ gallon for washing cooking utensils, and $\frac{1}{4}$ gallon unavoidable wastage. The animals will each require 5 to 10 gallons depending on whether the weather is cold or hot.

In combat: The amount necessary to retain efficiency should not be less than the minimum of 1 gallon per capita per day for a period of not more than three days. In extreme conditions animals can be limited to 5 gallons per animal per day.

Determination of Water Yield. In estimating the requirements of the command it is also important to calculate the yields that may be expected from the sources of water

available. This estimation of a small stream should not be made immediately after a rainstorm, and if circumstances do not permit any other time consideration must be given thereto.

This estimation can usually be done only by actual measurement. The water content in cubic feet of a well, pool, or other container of standing water is determined by multiplying its surface area by its average depth, determined by the best measurements possible. Having found the contents in cubic feet, multiply by 7.48 to determine the number of gallons. The daily yield is usually also of importance. To determine the yield of a well or spring, lower the surface rapidly by pumping; measure or calculate the amount pumped out, and note the time required for the well to regain its normal level. Thus if the surface of a circular well 4 feet in diameter be lowered 2 feet by pumping, the amount pumped out is $\pi \times 2^2 \times 2$ or $3.1416 \times 4 \times 2 = 25.13$ cu. ft. = 188 gallons. If the well regains its level in one hour its daily yield is probably at least $188 \times 24 = 4512$ gallons, and may be more.

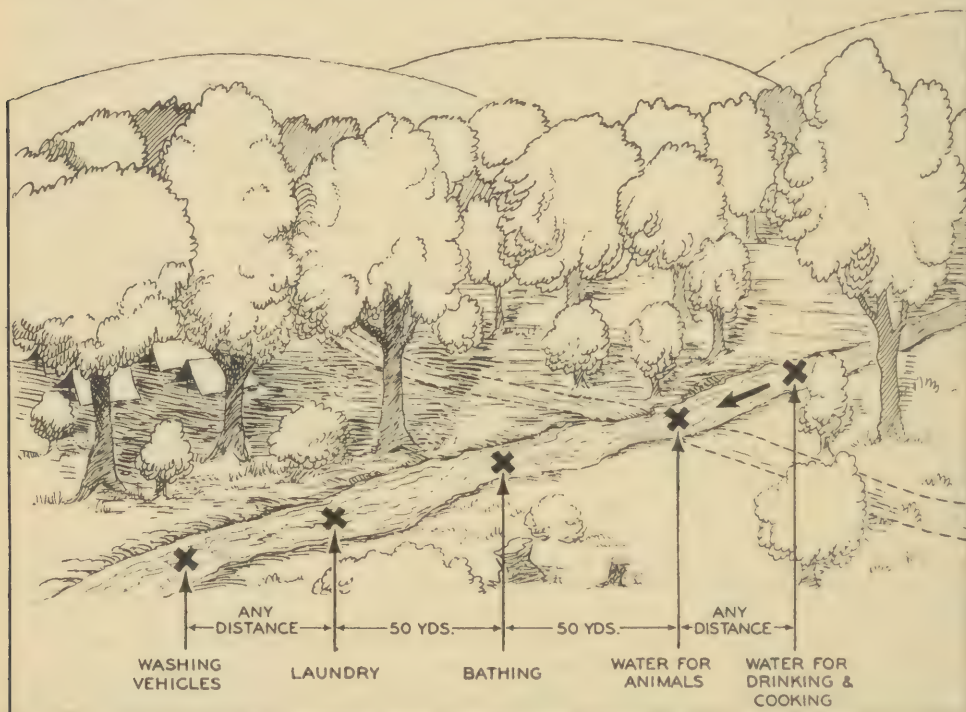


Plate 3. Location of Water Sources (Stream).

The volume of flow of a small stream is determined as follows: Select a fairly long reach in which the channel is straight, uniform in size (or nearly so), and free from eddies. Determine the cross-section area of the water at the center of the reach selected by measuring the width (w), and taking several soundings across the stream (d). Measure any convenient length (l), as 30 or 50 feet, on the bank and mark the ends. Now drop a chip of wood in the center of the channel upstream and note the number of seconds (t) it requires to travel the measured distance. Divide the distance in feet by

the time in seconds, $\frac{d}{t}$, giving the surface velocity in feet per second. The mean

velocity is about 0.8 of the surface velocity. Multiply the cross section area in square feet, $w \times d$, by the mean velocity in feet per second and the result is the flow of the stream in cubic feet per second, (Q). This entire calculation can be set up in one

formula. $Q = \frac{0.8 \times w \times d \times l}{t}$. The number of gallons per second is calculated by multiplying Q (cubic feet per second) by 7.48 (the number of gallons in a cubic foot of water).

In very small streams it may be necessary to build a dam or insert a receptacle (such as a cask) in the bottom to conserve the flow. The flow from a weir in the dam may be caught and measured, or the time required to fill a cask in the bottom noted. A standard cask holds about 55 gallons.

Protection of Water Supply Sources. Every source of water supply, civilian or military, should be carefully guarded against pollution. The principal and most dangerous pollution is human and animal excrement or sewage; these wastes are often intentionally placed in water to dispose of them or are washed in from deposits of excrement on or near the surface of the ground. During droughts, surface and ground waters are more likely to be polluted than under average conditions. During floods high water reaches deposits of excrement and washes them into the watercourses. Such deposits would not ordinarily be dangerous.

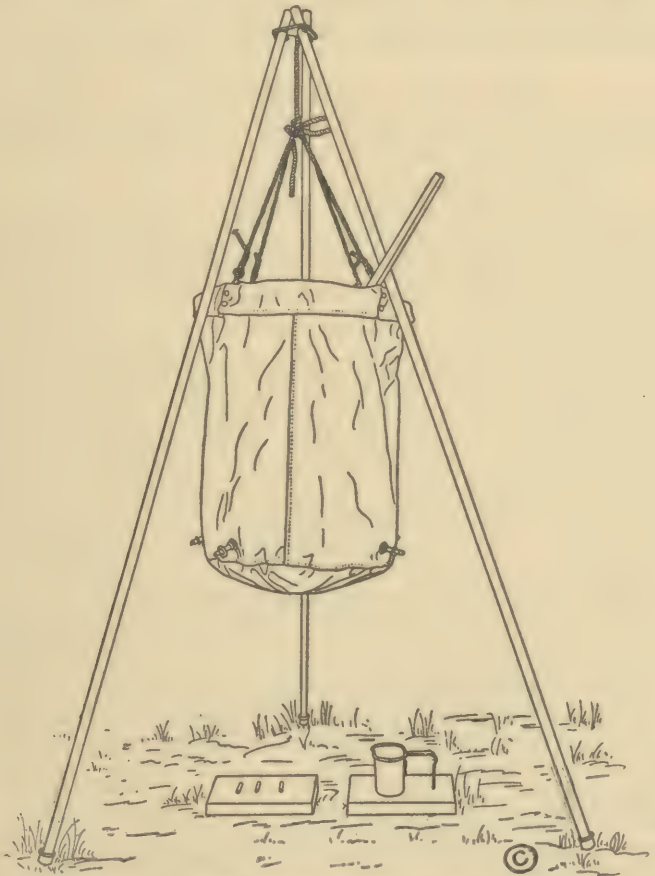


Plate 4. Water Sterilizing Bag, with Tripod.

Water supply sources for military forces can be, and usually are, carefully guarded so as to minimize the possibility of local pollution. Latrines are placed so that surface or underground drainage from them cannot reach the water source. Great care must be taken that the watershed is not contaminated by careless individuals. When streams are used as a source of water, points along the stream are designated at which water for

various purposes may be drawn. Beginning upstream the following points are designated: water for drinking and cooking, water for animals, and water for washing and bathing (Plate 3). It is often necessary to place a "water guard" to enforce compliance with such instructions.

Purification of Water. In the field just as in permanent stations it is necessary to purify water. This not only includes the destruction of bacteria, including possible pathogenic organisms resulting from the pollution of water, but also the removal of turbidity, color and obnoxious tastes and odors.

Chlorination is one of the most effective measures of purifying water from pathogenic organisms. It is an accepted fact that one part of chlorine per million parts of water will kill most, if not all, of the bacteria contained in the water providing sufficient time is allowed for the action to take place. In practice, calcium hypochlorite or chloride of lime is used, preferably the Grade A calcium hypochlorite which contains about 70 per cent available chlorine. For field water supply the amount used should be such that the residual chlorine in the treated water will be 1.0 part per million. The use of sodium thiosulphate is not permitted to neutralize the excess chlorine. It is best to use a small amount of Grade A calcium hypochlorite initially, testing it with orthotolidine immediately after the addition of hypochlorite solution until sufficient residual chlorine remains.

Sedimentation is the storage of water in some reservoir device so that the material in suspension in the water, causing turbidity, can settle to the bottom of the container.

Filtration is the removal of turbidity from the water by allowing it to pass through a bed of sand.

Coagulation is the addition of a chemical, usually alum or aluminum sulfate which reacts with the carbonates and bicarbonates of the water to produce an insoluble flake-like substance, aluminum hydroxide or "floc," which entraps the bacteria and the finer particles in suspension in the water. Coagulation is used in conjunction with sedimentation and filtration.

Purification of Water in the Field. Within each general service unit of the Corps of Engineers there are portable purification units, easily transportable and capable of being set up and placed in operation in a relatively short period of time. As indicated by its name the purpose of the unit is to convert water of questionable purity and clarity to safe, clear drinking water. To accomplish this the water is lifted from the stream, lake, pond, or well by a gasoline driven pump. It is then sterilized by chlorination, clarified by filtration in a rapid sand filter, and finally delivered to a 3000 gallon canvas reservoir for storage and distribution. One of these units can deliver approximately 600 gallons of purified filtered water in one hour.

Assigned to each field army there is an Engineer Battalion, water supply, whose essential equipment is the mobile purification units. One of these units accomplishes the purification of water in the same manner as the portable purification unit except it is on a larger scale. It is mounted and transported on a 2½ ton truck and it is capable of delivering approximately 4200 gallons of purified, filtered water in an hour.

In certain situations it may be impossible to obtain purified water from the Corps of Engineers. The water may be purified in such an instance through the use of the water sterilizing bag (Lyster bag).

The equipment consists of a water bag of canvas or rubberized cloth, an ampule containing ½ gram of Grade A calcium hypochlorite, and orthotolidine solution for testing residual chlorine.

The bag and the chemical are obtained from the Quartermaster Corps, not from the Medical Department. The canvas bag weighs about 7½ pounds, holds about 36 gallons of water (20 inches in diameter and 28 inches in length), and is provided with a cover of the same material as the bag. It is solely a stationary receptacle in which water can be held while it is being sterilized and from which it can be distributed through faucets without dipping, these faucets being arranged around the bottom of the bag. This apparatus is issued to troops at the rate of one to each 100 men or fraction thereof.

The procedure is as follows:

(1) Suspend the bag on a tripod. Fill it with water to the mark four inches from the top, straining the water through cheesecloth.

(2) Draw a small quantity of water through one of the faucets into a canteen cup.

(3) Break a tube of calcium hypochlorite into the canteen cup, stir with a clean stick making a paste and then fill the cup two-thirds full of water.

(4) Empty this solution into the water bag and stir thoroughly with a clean stick which is long enough to reach to the bottom of the bag.

(5) Draw at least one-half canteen cup of water from each of the faucets and pour it back into the water bag. This serves to sterilize the faucets.

(6) Wait 10 minutes, then wash out one of the faucets by allowing a small amount of water to run through onto the ground. Fill a clean canteen cup to a depth not to exceed $\frac{1}{2}$ inch, from the same faucet. Add one cc. (fifteen drops) of orthotolidine testing solution to the water in the cup. Wait five minutes and note the color produced. The following is a guide for reading the color reaction between the free chlorine and orthotolidine:

No color. Insufficient chlorination. Add more calcium hypochlorite.

Canary yellow. Insufficient chlorination. Add more calcium hypochlorite.

Deep yellow. Satisfactory chlorination. This represents about one part per million (ppm) of chlorine.

Orange red. Overchlorinated. Add more water and re-test.

Bluish green. Alkaline or hard water. Add a few more drops of orthotolidine to get a correct color reading.

(7) As a factor of safety, the water should be allowed to stand for thirty minutes after the addition of a satisfactory amount of calcium hypochlorite before being used for drinking purposes.

Chlorinating Water for Small Detachments. Frequently small detachments are separated from the main body and from the supply of chlorinated water at the company messes. There are several good emergency methods for the sterilization of water. If $\frac{1}{2}$ gram (1 ampule) of grade A calcium hypochlorite is placed in a full canteen, this will be the sterilizing solution for the other canteens by using a canteen capful for each of the remaining canteens. Two to three drops of iodine in a canteen full of water will give considerable protection. The simple method of boiling for 10 minutes will destroy most pathogenic bacteria.

Transportation of Water. Standard 5 gallon water cans are issued to a unit on the basis of supplying each man with a gallon of water. These cans have only a small opening and can not be used for the distribution of water to the individual without considerable waste and danger of contamination.

Tank trailers with a capacity of 250 gallons of water are at present chiefly used by medical troops and certain Air Corps units. These trailers are for the storage, transportation and distribution of water.

Storage of Water in a Unit Area. If purified water is delivered to a unit from the Engineers or if it is necessary to chlorinate the water in the water sterilizing bag, this same bag is used for the storage of water within the unit area and for the distribution of water to the individual soldier.

Procurement of Purified Water from the Corps of Engineers. As mentioned in a previous paragraph the various units of the Corps of Engineers have portable or mobile equipment for the purification of water. The Engineer battalion, combat, within an infantry division has four portable purification units, each capable of operating at a separate water distributing point (W.D.P.) or several may operate at one water distributing point. It is intended that one portable purification unit can supply water to an entire combat team. Plate 5a shows how the water would be delivered from such a water distributing point to the water sterilizing bag using trucks of the regimental or battalion train for the transportation of the 5 gallon water cans.

It may be impossible to find suitable water sources within the divisional area. In such cases the services of the Engineer battalion, water supply, are utilized. A water dis-

tributing point would be established to the rear where one or several mobile purification units would operate, supplying one or more divisions. The water would be transported from this water distributing point (Plate 5b) by the large tank trucks or tank trailers, equipment of the water supply battalion. They would carry the water to the divisional water distributing point where it would be stored in the large 3000 gallon reservoirs. Distribution from this point would be in the manner illustrated in the previous paragraph.

In desert warfare or in operations over comparatively waterless terrain, great distances may be involved in delivering water from the source to the troops in the combat zone. It would be necessary to establish a water point or water depot (Plate 5c) in the communications zone. From this point the water would be brought forward by railroad tank cars or other similar means of transportation to the army railhead and thence forward in the usual manner (Plate 5c). An alternate method would be the delivery of water from the communication zone via the daily train to the divisional railhead.

Distillation of Water. On establishing a beachhead or when operating in desert country bordering the ocean, sea water or water containing alkaline salts may be the only source available to troops. Distillation is the only way alkaline salts may be removed from water. When impure water is boiled and the steam condensed, a pure water free from dissolved mineral and organic matter and from bacteria is obtained. However, except on a large scale, distillation produces little water for the amount of fuel consumed. In the modern army where mobility is paramount, efficiency in distillation apparatus must be sacrificed. Mobile equipment used in the Army will probably not produce more than 30 gallons of distilled water per hour. Small distillation apparatus may have to be improvised under special conditions.

Gas Contaminated Water. Water sources that are contaminated with warfare gases should be avoided if other supplies are available. If not, contaminated water will be considered as potable if it meets certain requirements. There should be no odor of any chemical agent before the water is chlorinated, nor should there be excessive cloudiness or discoloration. The addition of five parts per million of chlorine (2 ampules of Grade A calcium hypochlorite per water sterilizing bag) must produce a chlorine residual of one part per million or more. The pH (acidity) of the water before chlorination should be above 5.0. These tests apply to all known warfare gases that may contaminate water supplies with the exception of chlorpicrin. However, the treatment of contaminated water should if possible be left in the hands of the water supply personnel of the engineer units or of the engineer water supply battalion.

DISPOSAL OF WASTES

The disposal of waste products in the field, in camp, or in cantonment is the most important detail in field sanitation. Life in camp brings men in close contact with the soil under conditions where the usual sanitary devices of civilization are lacking, and unless great care is observed they will soon thoroughly contaminate the surroundings and disease will quickly spread. Field sanitary devices must be supplied to replace those of established communities, and various kinds of wastes must be disposed of in such a manner that pathogenic bacteria are eliminated. Waste must be changed so that it no longer promotes the breeding of flies and other disease-carrying pests, and nuisances must be prevented.

The wastes to be disposed of are of two classes: solids consisting of human feces, kitchen garbage, stable refuse, general camp refuse, and carcasses; and liquids consisting of urine, kitchen sillage, and ablution sillage. They may also be classified as human wastes, kitchen wastes, animal wastes, and rubbish.

Excreta. On the *march* and in temporary camps there is no other method of disposing of human excrement except in the earth. On the march soldiers should be instructed to dig a small pit into which they should void their excrement after which it should be covered with earth. It is not only unsanitary but creates a nuisance if this precaution is not observed. In temporary camps disposal of human excrement is done by means of shallow trenches (straddle trenches) or in pits of various depths. Since nitrifying bacteria

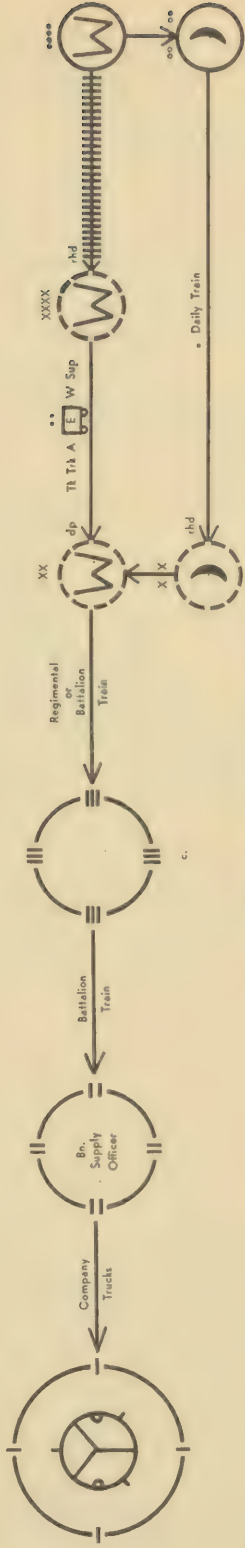
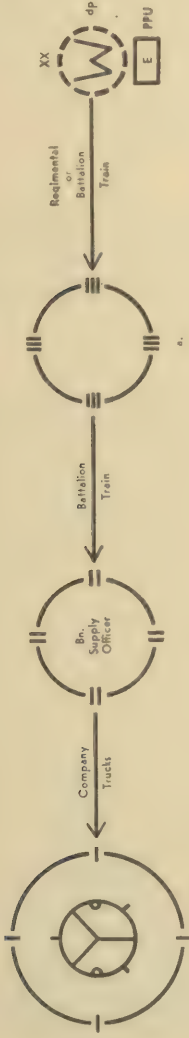
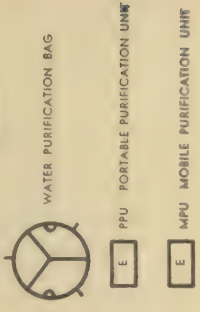


Plate 5. Water Logistics.

are not found normally in the soil at depths greater than 18 to 24 inches the action of these bacteria does not take place on the fecal material in the pits. Organic matter derived from the intestinal tract decomposes very slowly requiring several months to a year to break down into stable compounds. This is one reason why old camp sites are not desirable.

At temporary camps of less than one week, bivouacs, and on long halts, the method of disposal of fecal material is by the straddle trench. This is a trench about one foot wide, 18 to 24 inches deep, and long enough to provide for 8 per cent of the command at one time, allowing two feet per man (Plate 6). Instead of one long trench a number of parallel trenches or individual straddle trenches (2 ft. in length) may be constructed. The

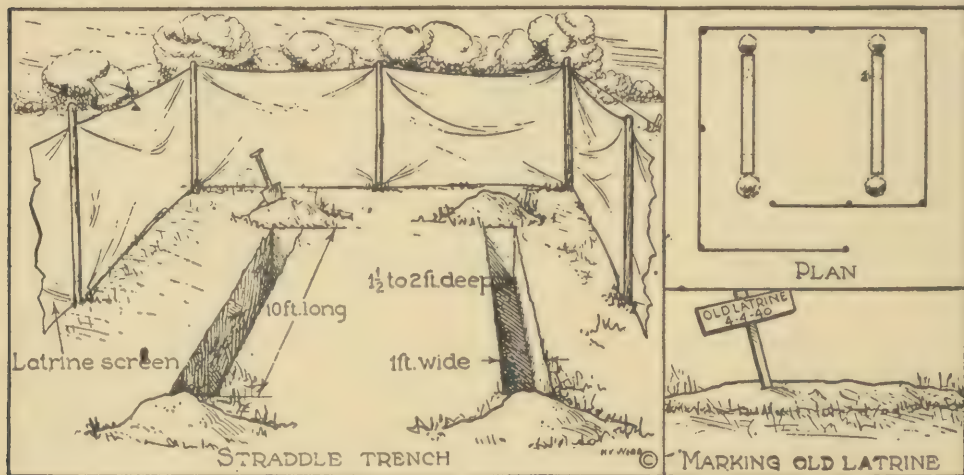


Plate 6. Straddle Trench Latrine.

excavated earth is placed at the ends of the long trenches or at the center between parallel short trenches. The whole should be enclosed in a canvas screen so as to insure privacy. A latrine guard is usually designated to enforce cleanliness. Men are required to cover their excrement and toilet paper with a shovelful of soil. If crude oil is available the trench should be sprayed daily with this oil. When the trench is filled to within one foot of the top it should be back-filled with earth, mounded up to one foot above the ground surface, and marked by a suitable sign.

All latrines should be constructed to the leeward of camp (if there is any prevailing wind); 75 feet from the nearest tent or other quarters; 100 yards from kitchens and mess halls; and 100 feet from *any* source of water. They should be on high ground or so ditched that storm water cannot flood the area and the ditches and so spread the excrement over the surface.

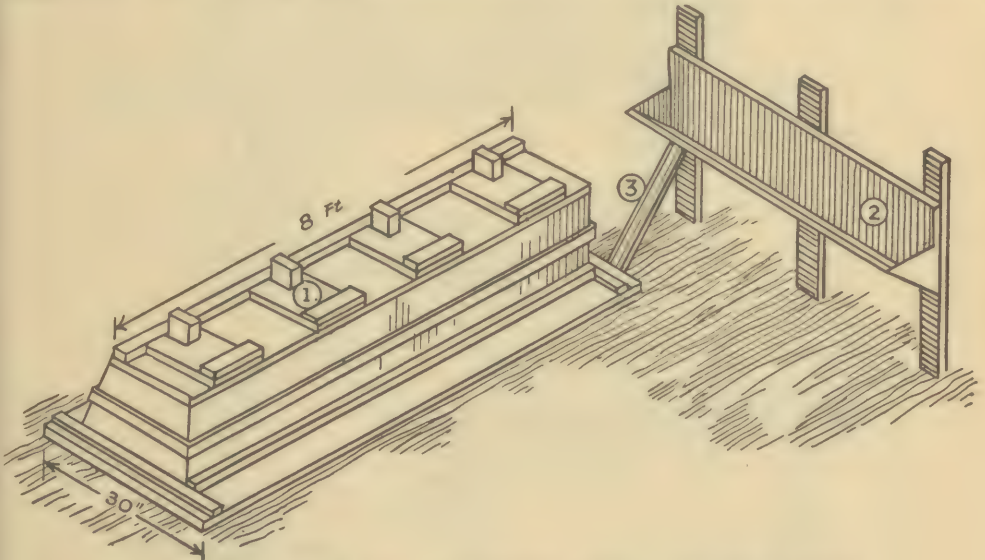
All latrines should be marked by suitable lanterns at night, whenever the military situation permits, so that men can find them easily.

The Pit Latrine for Camps of More than One Week. For camps of over one week duration straddle trenches are used until *pit latrines* can be constructed. Deep pits should be two feet wide, from four to ten feet deep, and eight feet (or some multiple of eight) long. The depth will depend on the length of time that the latrine is to be used, the depth of the ground water, the character of the soil, and the presence or absence of rock. If the level of the ground water is high it is useless to make a deep pit as water will seep in and interfere with the drainage and sanitary care of the pit and also, there is danger of contaminating a nearby source of water. In the same way a stratum of impervious clay prevents soakage of urine. Rock will prevent deepening the pit unless explosive is used, which is seldom worth while. If explosives are used, fissures may be opened in the rocks, allowing wastes to seep through and possibly contaminate nearby sources of water.

In average soil a pit four feet in depth should be sufficient for two weeks. For a longer period a foot in depth should be added for each additional week. For four weeks a pit six feet deep is required and for six weeks a pit of eight feet in depth.

Like the straddle trenches, these pit latrines must be protected from surface water by the construction of a drainage ditch around the outside, and they should be provided with canvas latrine screens for privacy.

If in very soft ground the pit must be protected by sand bag revetments or shoring and made correspondingly larger. All of these pits must be *fly proof* in so far as is possible. Flies lay their eggs in the fecal material, where they hatch into larvae. When these larvae are ready to pupate they migrate to a dry place. They may migrate four feet through loose loamy earth, and the adult fly may penetrate a distance of one foot. In order to prevent these young adults emerging to the surface the area around the latrine must be made impervious to them. This is done by excavating an area four feet wide all around the pit to a depth of six inches. The floor of this excavation is then covered with burlap that is soaked in crude oil and the area again covered with the soil. The burlap should hang over the edge of the pit to a depth of eighteen inches. If no burlap is available then a three inch layer of soil should be tramped down with oil and this again overlaid with another three inches of packed earth that is well oiled. If oil is unavailable water may be used.



(1)—Standard latrine box. (2)—Trough urinal. (3)—Pipe leading from urine trough into latrine pit.

Plate 7. Pit Latrine for Temporary and Semi-Permanent Camps.

The latrine box is provided by the quartermaster. (See Plate 7). It consists of a box eight feet long, provided with four seats, all having covers. The covers are so constructed that they automatically close when they are not held open. This is accomplished by placing a block near the hinge of the seat cover which prevents the cover from being raised to or beyond a vertical position. They thus close automatically from their own weight when the user leaves the seat.

The edge of the pit should be curbed so that it will fit close to the box, so that it will not cave in, and so that the passage of flies is prevented. The front (inside) of the box should be guarded with a strip of sheet metal to divert urine into the pit, and the back should be sloped to prevent fouling with excreta.

The bottom of the pit, sides, and interior of the box should be sprayed daily with crude oil. This kills the larvae of flies, acts as a deterrent to the adults, and serves as a deodorant.

When the pit is filled to within two feet of the surface it should be abandoned and

covered with earth to a height of two feet above the ground surface. If the locality is to be occupied by troops in the next few months the spot should be marked as the site of an old latrine.

Pit latrines should be at least seventy-five feet from the nearest tentage, 100 yards from kitchens and mess halls, and 100 feet from *any* source of water, and should be marked with a lantern at night, if the military situation permits guarded by a latrine police. The seats should be washed with hot soapy water daily and 2 per cent cresol solution twice a week. In rainy weather some sort of shelter against the weather must be devised.

Pail latrines may be employed but this requires much more equipment and more efficient policing. They are frequently used in caring for the excreta of sick who cannot be evacuated from camp. Contents of pail latrines should be buried or burned.

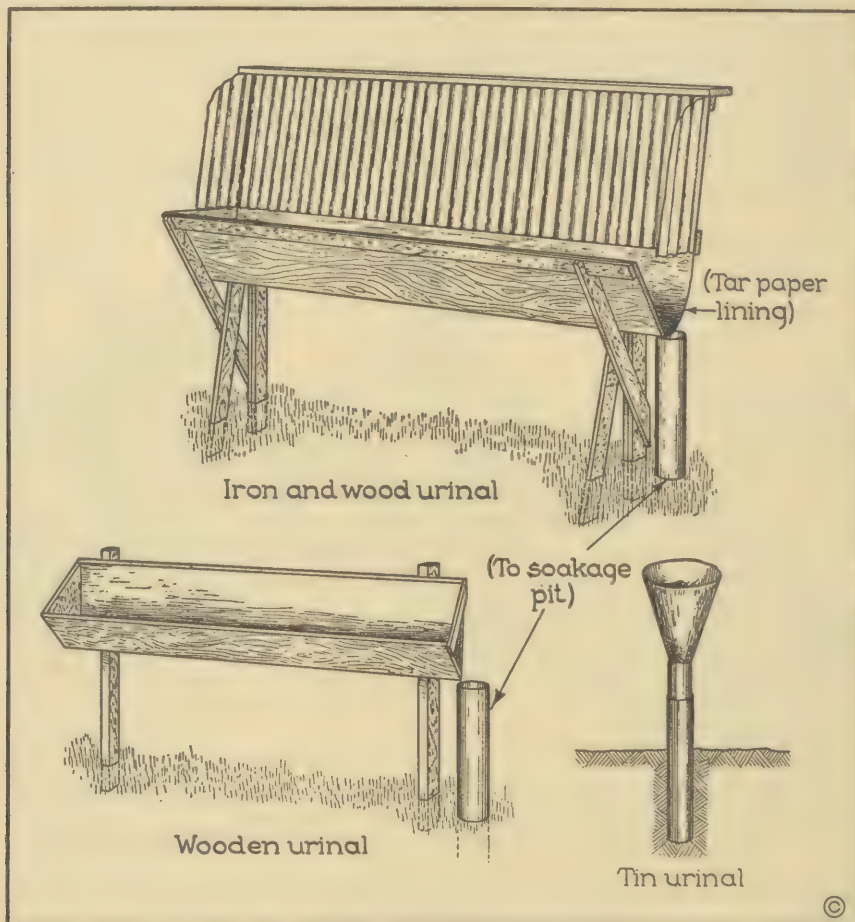


Plate 8. Urine Troughs.

Disposal of Urine. For one night bivouacs, the straddle trenches may be used for disposal of urine as well as feces. But if the command is to remain any length of time urine troughs which drain into the deep pit latrines or into special soakage pits should be constructed.

When the deep pit latrine is located in porous soil that readily absorb liquids, the urine trough may drain into the pit. If the soil is heavy impermeable and does not readily absorb liquids, then the trough should drain into a urine soakage pit. Urine troughs may be made of wood or of galvanized iron. If the trough is made of wood it should be lined with tar paper so that the wood will not become soaked with urine.

Troughs consist of an upright back (splash board) against which the urine is voided and a gutter to collect and drain the urine. (Plate 8.) At its low end this gutter should drain into the latrine pit or special soakage pits. All troughs should be washed down daily with hot soapy water and twice a week with two per cent cresol solution to control odor and prevent the deposition of urates which soon become malodorous.

The *soakage pit* is about four feet square and four feet deep, filled with broken stone or coarse gravel from one to four inches in diameter. If rock or gravel is not available the pit may be filled with flattened tin cans, broken bottles, or pieces of concrete. (Plate 9.)

Soakage pits should be ventilated in order to aid oxidation and thereby prevent odors. This is done by means of wooden ventilating shafts (4 to 6 inch boards nailed together to form a square shaft) that are placed in the pits on two sides, extending from about a foot above the surface to within six inches of the bottom. The top of the shaft should be screened against the admission of flies and refuse. Wooden shafts should have several holes bored through the side that faces the interior of the pit to facilitate the circulation of air. In place of wood, tile shafts or stove pipe may be used. For best ventilation the top of the pit should consist of fine crushed stone or gravel, rather than earth which becomes packed.

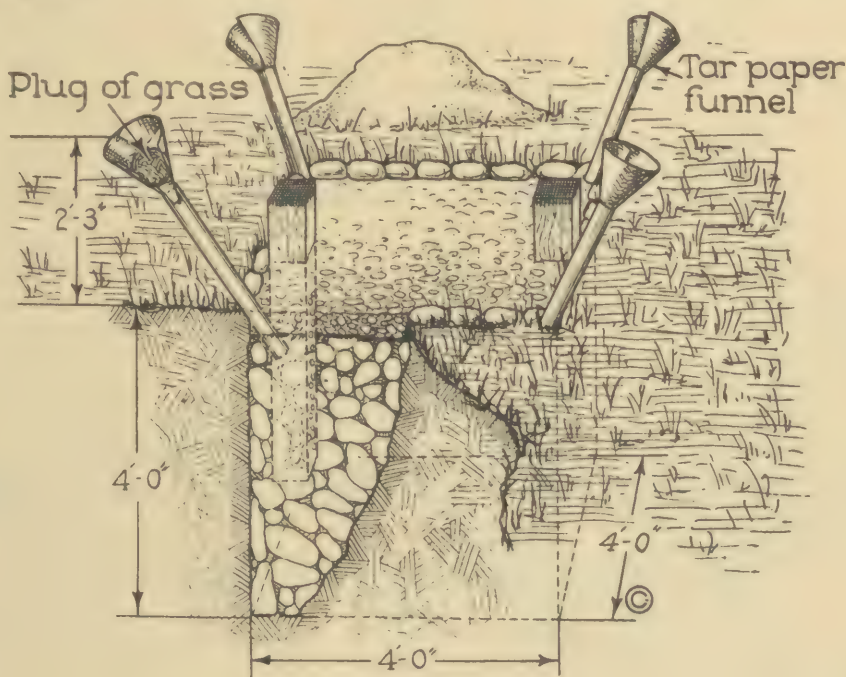


Plate 9. Urine Soakage Pit.

In the four corners of the soakage pit *pipe urinals* are placed. They consist of iron pipes inserted at an angle of about thirty degrees from the vertical and extending about one foot below the surface and thirty inches above. The mouth should consist of a tar paper funnel about 6 to 8 inches in diameter containing grass or straw. In the event that space is limited, as many as eight pipe urinals may be placed in each pit.

Soakage pits serve not only to promote absorption of the urine but also help to oxidize the organic matter as it passes over the stones in contact with the air. The efficiency of the pit depends on the character of the soil and the depth of the ground water. In good absorbent soil a pit should last indefinitely, one pit serving 200 men.

Soakage pits may be inclosed within the same canvas screen as the pit latrine, but in the event the trough urinals are used the pit may be placed outside the screen while the trough is inside. All pits should be placed so far away from camp as not to constitute a nuisance and not to contaminate the camp water supply.

In the care of the pits the ventilating shafts should be kept clean and functioning, the top should be kept free of debris and the grass, straw, and tar paper funnels should be frequently changed and the old ones burned. *Oil should not be used in the pits as it clogs the soil and interferes with the absorption of the urine.*

When pits are abandoned the funnels and drains are removed. The top of the pit may be covered with a shallow layer of soil.

At night urine cans are placed in the company streets and marked by lanterns, if the military situation permits. In the morning these are emptied into the urine pits and burned out with oil and hay. Urinating upon the ground should be strictly forbidden.

In the tropics and jungles, ant heaps and nests of other termites have been used as ready made soakage pits and have been found capable of absorbing 300 gallons of waste liquids in 24 hours.

In arctic and sub-arctic lands the disposal of human wastes, in a safe manner, is a problem of major importance. The soil in these regions is always water-logged and during the winter months is frozen solid to great depths. Soil excavations for straddle trenches and deep pit latrines is usually impracticable, if not physically impossible. When troops are on the march or in bivouacs that will not be occupied later, straddle trenches may be dug in the snow. When abandoned they are covered with brush or snow and properly marked. In extreme cold pail latrines may be used within a heated truck.

In semi-permanent, or more or less permanent camps, pail latrines may be used. Solids and urine should be separated. The solids can be satisfactorily burned if mixed with sufficient dry, combustible material (wood chips, rubbish, etc.,) to afford proper incineration. The separated urine may be treated with a cresol solution to inhibit the growth of pathogens and then disposed of through holes in the ice into nearby streams or it may be buried in the snow or water-logged earth.

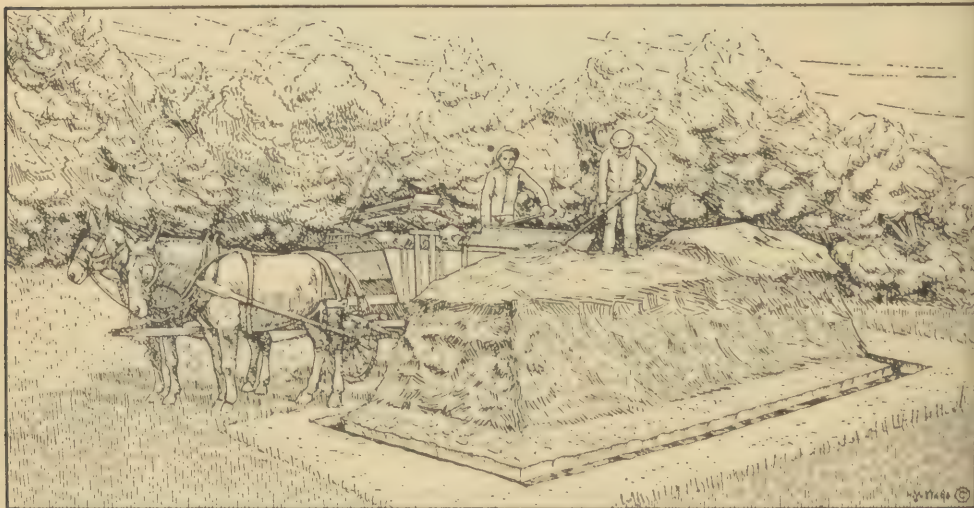


Plate 10. Composting Manure.

Manure. Horse manure affords a choice place for the breeding of flies and therefore presents a problem for the sanitarian and the medical officer. It may be disposed of in a number of ways: by composting, by drying, by incineration, by removal by contract or used as fertilizer. Picket lines should be thoroughly swept each morning and the manure removed for disposal before 10:00 A.M. The area about the picket line should be sprayed with oil and firmly tamped at least twice each week.

Disposal by composting. The success of composting rests upon the fact that horse manure placed in piles, kept moist, and packed compactly quickly generates heat so that

a temperature as high as 140 to 160 degrees F. is produced at depths greater than eight inches. Fly larvae are killed very soon by temperatures of 115 degrees F. or above. The manure should be piled on hard bare ground and beaten down each day. Before flies can breed in the top layer it is buried by fresh manure and becomes heated, killing the larvae. Accordingly very few flies can breed in such heaps. The generation of heat is facilitated by moisture, so in very dry weather the heap should be moistened daily. If manure does not accumulate fast enough to prevent the surface layers breeding flies the heap may be covered with a thin layer of puddled clay or soil or even with oiled burlap, or the sides may be stripped at intervals of three days and the manure buried. Larvae in the outer layer may be killed by spraying with one of the following larvacides:

- (a) 2% solution of cresol in a mixture of 1 part kerosene and 4 parts fuel oil.
- (b) 2% solution of cresol in soapy water.
- (c) Waste motor oil.
- (d) Crude oil.

These are given in the order of their efficiency. If the manure is to be used for fertilizer the above larvacides will destroy its fertilizing value. Under such circumstances a larvacide of 1% solution of sodium arsenite should be used.

Any flies that manage to survive this composting process will migrate into the surrounding dry soil to pupate. This migration may be prevented by digging a ditch one foot wide and one foot deep on the four sides of the compost pile and filling the ditch to a depth of three or four inches with a light fuel oil. The area around the compost heap should be smoothed off for a space of four feet on the four sides and the soil packed down with crude oil weekly.

Drying manure. When manure is disposed of by drying it is spread in thin layers over the ground, one to two inches thick. All lumps should be broken up and the manure spread evenly. Flies cannot breed in dry manure, so care should be taken that the layer is thin enough to receive the full effects of the sun. When dried the manure may be stacked or burned, or be left as fertilizer. This method can only be used in a dry climate.

Burning manure. Manure may be disposed of by burning. This may be accomplished by making windrows or stacks, or by incineration. If the former two methods are used, the manure is sprayed with crude oil and burned. Some fuel oil will be saved if the manure is spread out to dry prior to stacking before burning. If prepared incinerators are used they may be of the same kind used in the disposal of garbage, or more open ones may be employed. An easily constructed and efficient manure incinerator may be made out of railroad rails (or any long iron bars) elevated on bricks or piers and set as a grid. Care should be taken not to tramp manure into the ground around the incinerator and thus create a breeding place for flies. Manure incinerators or compost piles should be located over 1000 yards from camp. Fly traps baited with a putrefactive bait should be kept in the vicinity of the compost pile.

Garbage Disposal. Garbage consists of waste food and the non-edible portions of food-stuffs, together with waste materials resulting from their preparation. It should not include tin cans, rubbish, or sweepings. (See Plate 12.) The amount produced is from two ounces to one pound per man per day, averaging 0.8 pound per man in large camps or about six to eight tons for an infantry division daily. Of this amount 65 to 80 per cent is water and the rest solids. About 85 per cent of the solids is combustible.

In bivouacs or temporary camps disposal of garbage is best accomplished by *burial*—construction of trenches of two to three feet in depth and of sufficient size to accommodate the garbage and allow a back-fill of one to two feet of dirt. Shallow covering will allow more rapid decomposition but may be uncovered by storm drainage; therefore, a sufficient back-fill must be used. The area used should be over 200 feet from camp. Crude oil should be sprayed on the garbage after unloading. At the noon-time halt on marches, waste food and drink may be disposed of by burial with the human wastes in the straddle trench latrine. This eliminates the need for a separate garbage pit.

In temporary camps when burial space is not available *incineration* must be resorted to, and that is accomplished by an open type of incinerator (Plate 11). A barrel-and-trench garbage incinerator can be easily constructed from an old garbage can or by molding clay

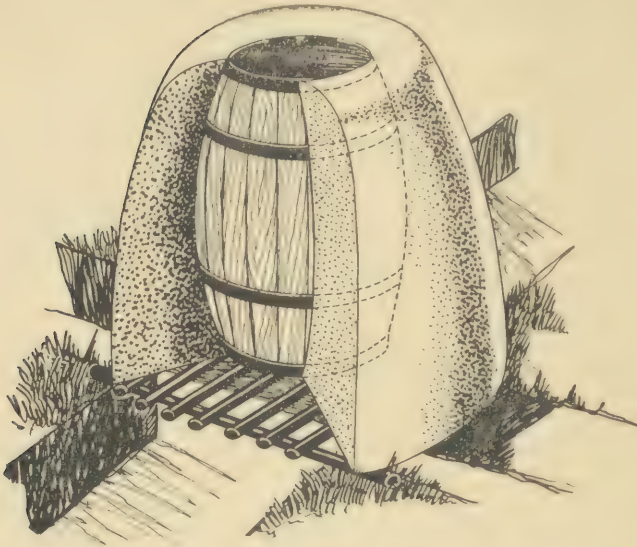


Plate 11. Stack and Cross Trench Incinerator.

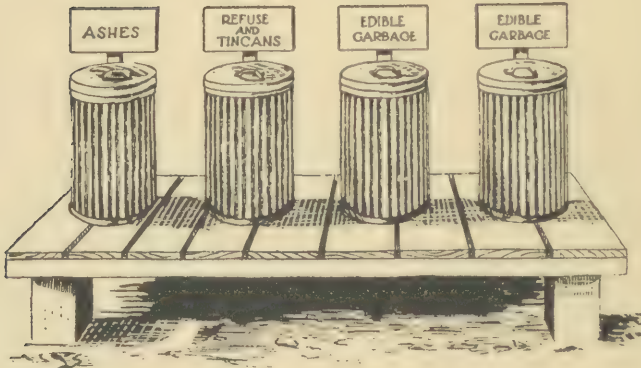


Figure 1. One method of labelling garbage cans for the collection of classified garbage. Garbage stand with Concrete Base.

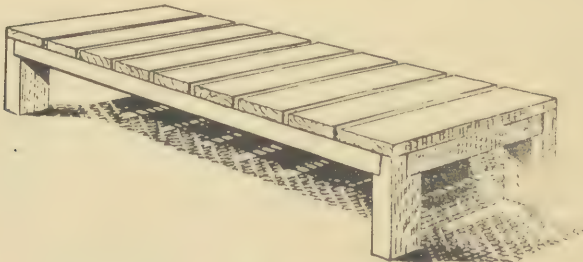


Figure 2. Garbage stand made entirely of planks.
Plate 12. Garbage Stands.

around a wooden barrel, placing grates in the bottom. Garbage should be drained as much as possible and then the solid garbage should be fed slowly into the incinerator from the top. (See Plate 13.) A hot fire is made on top of the grate and is required constantly. Disposal of the waste liquid is discussed below.

In large camps and permanent stations garbage is frequently disposed of by contract to farmers and contractors. Some camps having over 500 troops can dispose of garbage by maintaining a hog farm; this requires rigid sanitary control to avoid becoming a nuisance. However, it is an economical method of disposal, and a personnel of 500 will support 10 to 15 hogs with edible garbage. Garbage may be disposed of as a sanitary fill. At the end of each day, all garbage placed on the fill should be covered with one foot of earth to prevent the escape of odor and to protect the garbage from insects, rodents and small animals. Garbage from 10,000 men for one year will cover an acre to a depth of six feet.

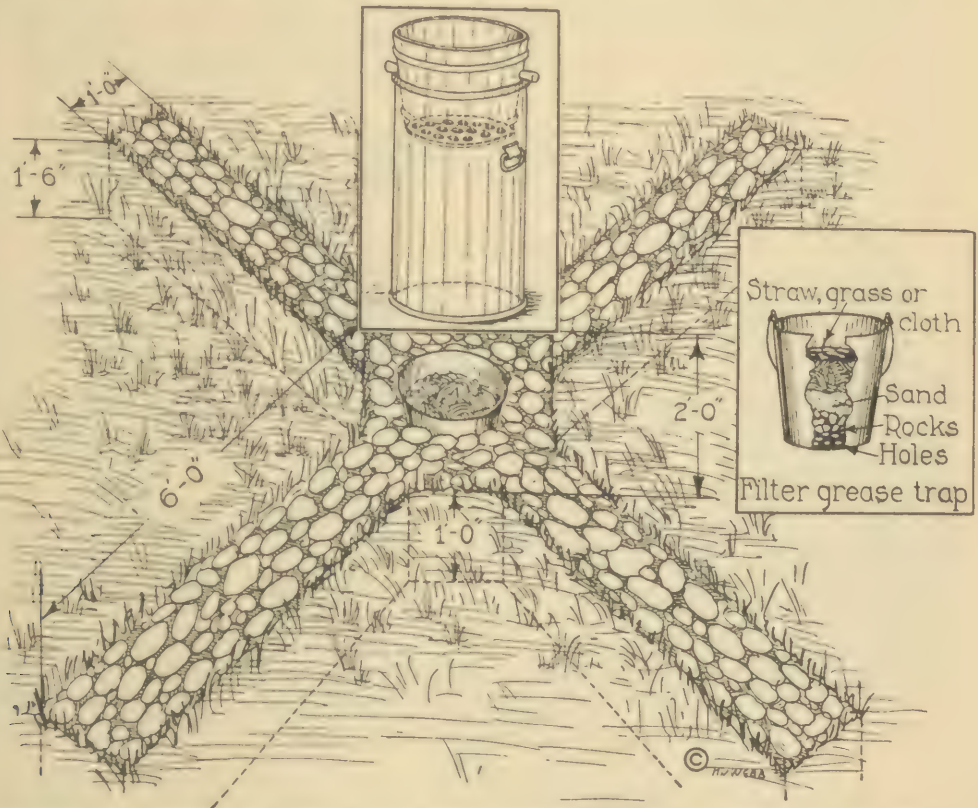


Plate 13. A Garbage Strainer and a Soakage Trench Showing Filter Grease Trap.

Disposal of Liquid Wastes. In camps, liquid waste must be disposed of by soakage pits or trenches or by hauling away in cans and emptying at some isolated spot. Most of these wastes, especially those from the kitchens and messes, are heavily charged with grease which, if not removed, clogs the soil, prevents absorption, and gathering on the surface makes an unsanitary nuisance. In order to remove such grease it is necessary to construct grease traps.

Soakage pits are the best means of disposal of waste liquids. Pits for such purposes are made exactly like urine soakage pits except for the urine pipes and funnels. Where there is a substratum of impermeable clay, of rock, or the ground water level is very close to the surface, soakage pits cannot be used and in their stead *soakage trenches* are made.

The *soakage trench* (Plate 13) is made by digging a pit two feet square and one foot deep. From each corner trenches are dug six feet long, being one foot deep at the pit end and eighteen inches deep at the extremities to provide for a flow outward from the pit. These trenches are about one foot wide. The hole is filled with broken stone, loose rubble, broken bottles and the like. A grease trap is installed in the center of this system. No ventilation is necessary as the pit and trenches are so shallow.

The principle by which these pits operate is the same as that of a sewage purification system by contact beds. A film forms on the contact material (loose rock) which contains many aerobic bacteria. These act on the contained organic matter of the liquid and oxidize it.

Two soakage pits four feet square and four feet deep will, in ordinary soil, take care of the waste liquids from kitchen and mess of a full war-strength infantry company (200 men). They should be used on alternate days. Each pit should be used one day and allowed to rest on the following day. Two soakage trenches of the dimensions given above will do the same. In impervious soil more pits will have to be constructed. These soakage pits and trenches are usually located in the vicinity of the company messes.

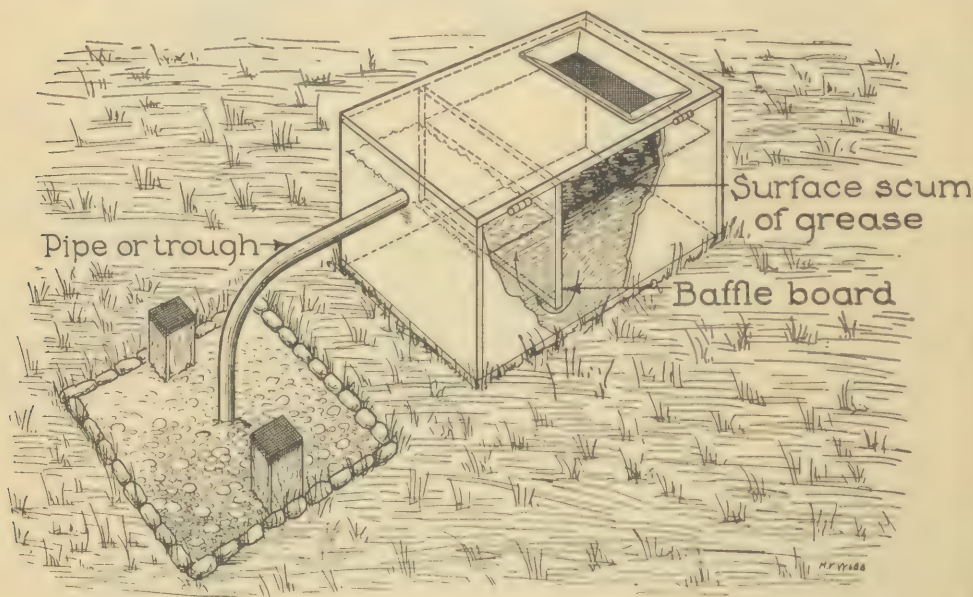


Plate 14. Baffle Grease Trap.

The pits may become sluggish in their absorption owing to collection of too much grease and organic matter. This may be remedied by a ten per cent solution of caustic soda or calcium hypochlorite applied in five gallon doses on alternate days until corrected. It may be necessary to loosen the surface of the soakage pit with a pick.

Grease traps are of two kinds, filter traps and baffle traps. The filter grease trap may be made from a galvanized iron pail or a large tin can with many holes punched in the bottom. The can, pail, half barrel, tub, or whatever is used is filled as follows: On the bottom is a layer of gravel, next is a layer of sand, and above that is a mass of straw, hay, grass, or cloth which filters out the coarsest fragments in the liquid such as crumbs, pieces of vegetables, and meat, etc., as well as retaining part of the grease. Such a trap is placed in the center of a soakage pit with the bottom buried about two inches below the surface. All waste water is poured through the trap. (Plate 13.)

A baffle trap is a container (half barrel or wooden box) that is divided into two chambers, an influent and an effluent chamber, by means of a baffle plate. The lower

edge of the baffle plate does not come to the bottom of the barrel but is separated from it by a space of about one inch through which water passes from one chamber to the other. A pipe or trough leads from the effluent chamber to the soakage pit nearby. (Plate 14.)

The baffle trap should be kept filled with cold water at all times. The warm waste liquids are poured into the influent chamber where the grease rises to the surface and is prevented from passing to the effluent chamber by the baffle plate. Some form of coarse filter should be placed over the mouth of the influent chamber in order to catch the larger fragments of food and debris. The retained grease is removed at intervals by skimming off from the surface of the influent chamber. The skimmings should be destroyed by fire or buried. The grease trap should be washed daily with hot, soapy water.

In bivouacs and camps of very short duration waste water should be disposed of by dumping on the surface of the ground or into shallow open trenches. Trenches should be back-filled with earth when abandoned. In the arctic regions liquid kitchen wastes are disposed of through holes in the ice directly into streams or by evaporation.

Other Wastes. Incombustible wastes should be hauled to some regular dump at least 1000 yards to the leeward of camp. Bottles and tin cans should first be burned in order to destroy the organic matter in them and then smashed or punctured so that they cannot hold water and serve as a breeding place for mosquitoes. If they cannot be burned, they should first be thoroughly freed from their contents by rinsing them with hot water or steam.

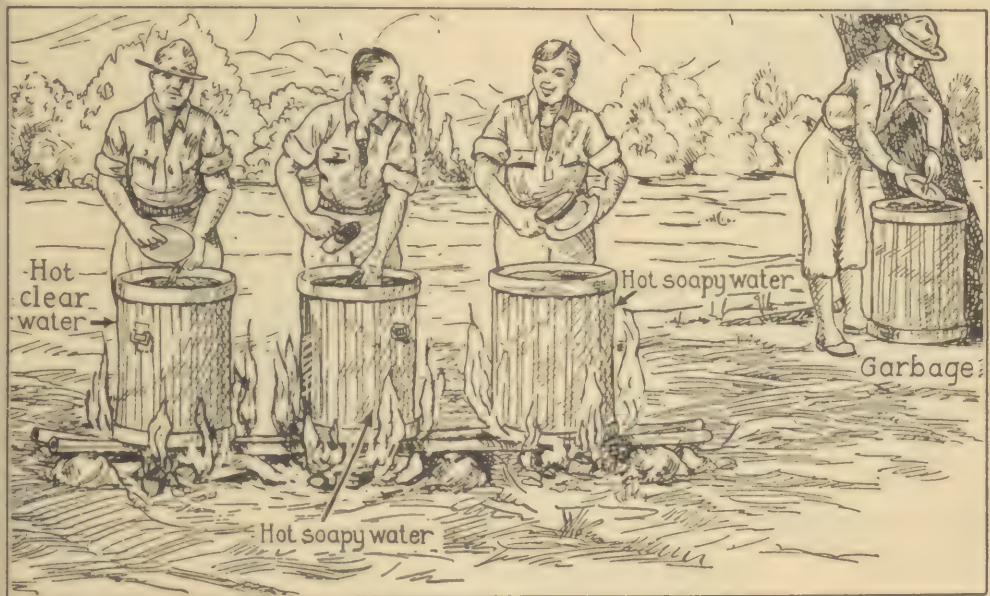


Plate 15. Washing Mess Kits in the Field.

Papers and rubbish which can be readily burned should be burned. They should be collected in separate cans and not mixed with the garbage, especially if the garbage is to be fed to animals.

Carcasses should be sold when practicable. Otherwise they should be disemboweled, the intestines punctured to release gas, and the viscera buried. The carcass is then dragged over this spot, the body cavity filled with combustible material, and the whole soaked with oil and burned. The carcass becomes charred and is unattractive to flies. It should then be buried.

Salvage material which is of no future value should be demolished as not to hold water and serve as breeding places for mosquitoes. Such is especially applicable to oil

and fuel containers, truck bottoms, fenders, or other articles which will retain water after a storm.

Dumps should be kept orderly; that is, all organic and combustible material should be burned, all other materials covered, and surface drainage provided by means of ashes or dirt. If used over a long period, the top soil should be seeded with grass as completed.

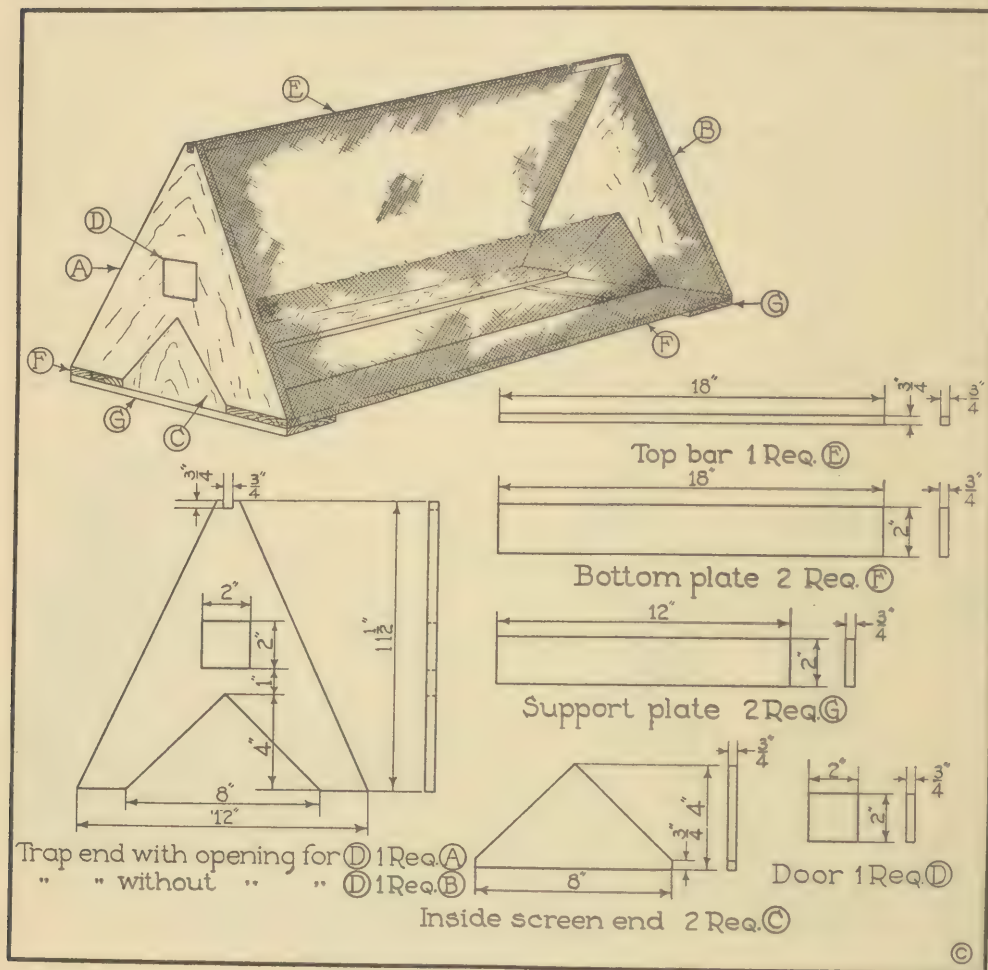


Plate 16. A Practical Fly Trap.

FIELD MESSES

The company mess is a very potent factor in the transmission of intestinal diseases, and to a lesser degree, of respiratory diseases. Furthermore, the character of the mess has a decided influence on the morale, physical fitness, and natural resistance of the individual. The basic consideration of mess sanitation is cleanliness. The essential features in proper mess sanitation are inspection and supervision of food handlers; inspection, protection from dirt and flies, storage, and preparation of food; cleansing and protecting from dirt and flies of mess gear and kitchen utensils; control of flies; and exclusion from the vicinity of the mess of any factors which might result in the contamination of food.

The normal field ration may be supplemented by local purchase of vegetables and fresh fruits. It is important that the ration be adequate, the menu varied, and the food well

cooked. If necessity demands the purchase of meats, the medical officer or veterinarian should closely inspect it for any indication of inferiority or contamination.

Cleanliness of Food Handlers. Food handlers should invariably maintain rigid personal cleanliness, especially in the field where hygiene demands more effort. The unit commander is responsible for the physical examination of all permanent food handlers. (Par. 12, AR 40-205 and Par. 37, FM 21-10). The term permanent food handler applies to all persons who are permanently assigned to duties that pertain to cooking and serving meals, as well as dish washers and kitchen helpers other than temporary

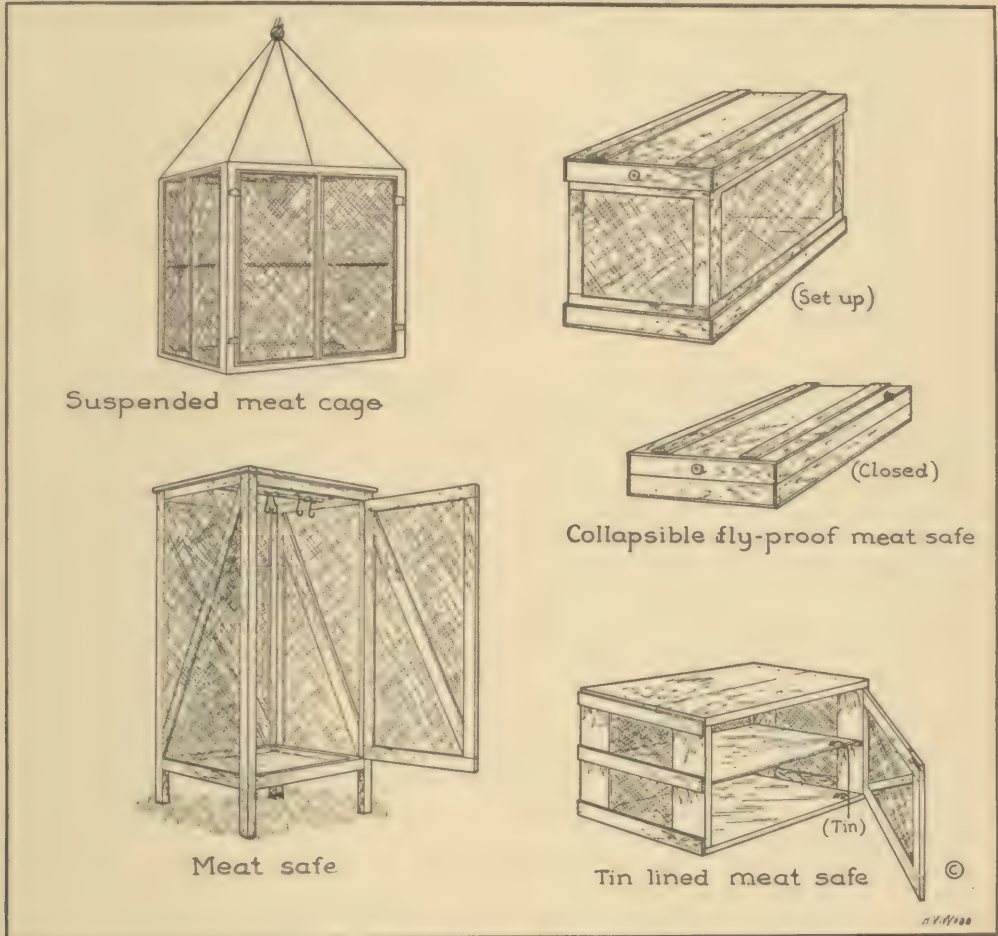


Plate 17. Improvised Meat Receptacles.

kitchen police. Unit commanders are required to send the names of all permanent food handlers to the surgeon. These men are then examined for clinical evidences of venereal disease, acute or chronic respiratory diseases, evidences of other communicable diseases and, if the surgeon deems it advisable, the stools are examined for causative organisms of the various intestinal diseases, nose and throat cultures are made and serological work performed. The names of the men free from evidences of disease are then sent to their unit commander and posted in a conspicuous place in the company mess. These food handlers must be observed carefully by the unit commander and surgeon to detect any indication of disease or failure to maintain proper personal hygiene.

Cleaning Mess Kits. Mess kits are used in the field, each soldier being issued one for his own use. It consists of a meat can, knife, fork, and spoon. Each man is required

to clean it after every meal, and this like all other utensils used in the preparation of food must be thoroughly washed and sterilized in boiling water. This is done as follows (Plate 15): Three large galvanized iron cans are filled with boiling water, the first two containing boiling soapy water and the other boiling clear water. Each man scrapes his mess kit and dumps the food scraps into a garbage can supplied for the purpose. He then passes his kit through the boiling, soapy water and then through the second container with boiling, soapy water. He then passes his kit through the boiling clear water and dries it by shaking it in the air. The water is kept as near boiling as possible throughout the entire process. The water should be changed after 100 mess kits have passed through, if in any way practicable. If boiling water cannot be prepared in the field, the water should be as hot as possible. Following the system outlined above, the third can or a fourth can, if available, should contain a solution prepared by dissolving one ounce of Calcium Hypochlorite in twenty-five gallons of water. This chlorine solution will satisfactorily sterilize the mess-gear, if allowed to remain in the solution for two minutes.

A method of providing heat for many purposes in the field is to take a No. 10 can, punch a number of $\frac{1}{2}$ to $\frac{3}{4}$ inch holes in the upper half, fill it one third with sand and pour in one-half can of gasoline. This can is placed in a small trench excavated in the earth. Over this is placed the container which is to be heated. The trench should be long enough to allow about two inches of air space for draft at the sides of the container and deep enough to provide about two inches clearance between the top of the can and the ground surface. The device may be ignited by dropping a flaming match into the gasoline in the No. 10 can.

Fly Control. Fly control is important to field messes as well as in permanent garrison. Flies are controlled by destruction of breeding grounds, by trapping, swatting, poisoning, fly sprays, and by fly wires and paper. A practical form of fly trap is shown in Plate 16. Mess tents should be screened in camps of some duration, such as summer camps or rifle ranges. Screened meat cages that are hung above the ground and screened meat safes may be improvised from boxes (Plate 17). Every effort should be made to avoid having food come in contact with flies. It is a difficult task in the field where many adverse factors influence cleanliness. However, the care of safe-guarding food from fly contamination is small in comparison to the effort necessitated in caring for those sick with intestinal diseases. Foods should not be allowed to stand unprotected but should be placed in their proper places. This is true of staples such as sugar as well as fresh foods. Whenever a fly lights he may leave disease germs which have been carried from some source of bacterial growth.

Sanitary Inspection of Messes. The principal purpose of a sanitary inspection of a mess is to determine the existence and nature of any defects which would result in contamination of the food and the transmission of disease-producing organisms to the troops, or which would impair the nutritive value or lessen the acceptability of the food as served to the troops.

The following outline may be followed in making a complete sanitary inspection of a mess. It is suggested as a guide only:

Attendants:

Is mess sergeant qualified for position as to—
Knowledge of food requirements and preparation of food?

Ability to maintain discipline?
Business ability?

Are cooks adequately trained? How?

Have food handlers all had "food handlers" examination and been certified as to health condition by the surgeon?

Are certificates of these health examinations posted in the mess hall in a prominent place?

Are food handlers cleanly as to—

Clothing?
Hair?

Hands (inspect fingernails)?

Personal habits? Care in washing hands after urination and defecation.

Is there a convenient washroom for food handlers?

Menus:

Does food served correspond with menu posted?
Are menus well balanced and amount of food adequate?

Check file of menus and mess account balance sheet.

NOTE:—Daily food supplied each man should yield at least 3000 calories, provide at least 100 grams of protein, and contain adequate vitamins.

Food supplies:

Meat and fish:

Source.
Quality.
Freshness.
Handling.

Storage.**Preparation.****Milk and dairy products:**

Same consideration as meat.

Has bacteriological and chemical analysis been made?

Is milk raw or pasteurized?

Fruit and vegetables:

Is supply adequate and satisfactory?

Are men educated to their use?

Are vegetables, which are to be served raw, adequately washed in running water then dipped in scalding water?

Canned foods:

Is supply satisfactory?

Are there swellers, springers or leakers present?

Bread and bakery products:**Source.****Quality.****Delivery method.**

Storage. (Elevated and isolated screened containers of adequate size.)

Food storages:**Refrigerator:**

Is space adequate?

Is temperature below 45° F?

Condition and sufficiency.

Cleanliness.

Disposal of drip water.

Pantries:

General neatness, cleanliness, and adequacy of storage facilities.

Vegetable storage:

Have vegetable bins been provided?

Condition of vegetables in storage.

Do facilities for storage guard against undue wastage by rotting?

Food preparation and serving:

Refer to cooks' training.

Is food served in a reasonably attractive manner?

Could you eat and enjoy the meals served and as served to the men in your organizations?

If not, what corrections are advisable?

Police:**Dishwashing:**

Does the method meet the requirements of Army Regulations? (W.D. Circular 76-1941)

Are trays, dishes, and utensils clean? Look between fork tines and around hilt of knife.

Is there evidence that all dishes and utensils have been properly sterilized and air dried?

Kitchen utensils:

Are pots and pans kept grease free?

Are they properly stored when not in use?

Are knives and forks clean? Look around handles and hilts.

Are racks, can openers and knife sharpeners kept scrupulously clean?

Are ranges kept clean?

Is fuel supply adequate?

Kitchen police:

Cleanliness of floors, walls, and ceilings.

Are dirty rags allowed to accumulate on ledges, top of bread box, top of refrigerator, etc.?

Are personal belongings of mess attendants allowed to accumulate in kitchen?

Waste disposal:

Does the handling of garbage and other wastes in the kitchen facilitate proper sorting and immediate removal to garbage cans at the garbage rack?

Is vegetable preparation and peeling carried out in a neat and satisfactory manner?

Is waste properly sorted and kept in proper receptacles?

Ashes.

Combustible trash and tin cans.

Edible garbage for piggery.

Nonedible garbage.

Are empty cans crushed and perforated before going to the trash can?

Has a trash and garbage stand been provided?

Is it kept clean?

Is the surrounding area kept dry and free from soil pollution?

Is waste removed at reasonable intervals? (daily)

Are clean containers provided at reasonable intervals? (daily)

How and by whom are containers washed?

How are wastes disposed of:

Ashes to dump? Location of dump?

Combustible trash burned? Where?

Garbage incinerated? Or sold?

If garbage is sold, are terms of contract being met as to—

Frequency of collection?

Method of collection?

Cleanliness of cans?

Insects and rodents:

Is mess screened adequately?

Is there a supply of fly swatters or other fly destroyers? Are they used?

Have fly traps been provided and are they kept properly baited and set up for use?

Are roaches and other insects present? If so, what method is being used to control them?

Are rodents troublesome? What steps have been taken for their destruction?

Meat and Food Products. Except in an emergency, food products of animal origin such as meat and meat products, poultry and eggs, fish and other seafoods, as well as all dairy products, usually arrive at the consuming organization after careful and thorough inspections by various civil and military inspecting agencies that have had as their purpose the protection of the health of troops by preventing the introduction of deteriorated or contaminated products into organizational messes.

Appropriate Army Regulations place the responsibility for the inspection of food products of animal origin on the Veterinary Corps of the Medical Department whose

purpose is to protect the health of the troops by preventing the purchase or issue of meat and dairy products which, by reason of their source, nature, handling, or condition, may be unsafe or unsuitable for food purposes. As a sanitary procedure, this is a direct extension of the sanitary service maintained by the Medical Department which assures a safe sanitary product up to the point of issue to troops.

However, when improperly handled and stored, meat and meat products are subject to rapid deterioration and during the time products remain in the company kitchens, messes, or refrigerators, very careful supervision should be exercised by medical officers to assure the use of only sanitary products.

Spoilage of Meat. Meat is considered to be unsound which has deteriorated or undergone any undesirable changes. The meat of a healthy animal is free from bacteria, and all bacterial decomposition is due to contamination subsequent to slaughter. It is not practicable, however, to prevent a certain amount of contamination during the handling of meat so that all fresh meat is more or less contaminated with bacteria and fungi. Where the meat is properly handled, the contaminating organisms are nonpathogenic but they may cause spoilage of meat. Under insanitary conditions the meat may be contaminated with pathogenic organisms. In meat which has been thoroughly dried and properly chilled, the bacteria grow slowly and the bacterial penetration is delayed while a moist and improperly chilled product is conducive to rapid bacterial growth and penetration. Bacteria may penetrate rapidly and deeply into the tissues by growth along moist surfaces between muscular tissues or through open vessels causing areas of decomposition in the deep parts of the tissues and around the bones without evidence of surface deterioration.

Preservation of Meats. In order to prevent or retard bacterial invasion resulting in decomposition, products must be stored in a temperature which is not conducive to bacterial growth. Meat which has been properly handled prior to receipt will usually remain free from decomposition for from 6 to 10 days if immediately placed in a temperature of about 35° F. However the average ice box or refrigerator maintains a temperature of from 45° F. to 55° F. and is not satisfactory as storage for more than 48 hours. It is essential that meat under refrigeration be hung in such a manner as to allow free circulation of air around it. Covering or wrappings should be removed to hasten chilling process. If adequate refrigeration is not available, meat must be cooked and served immediately.

Refrigerators. A refrigerator or ice box should be desirably located, preferably away from heat of stoves or direct rays of the sun. It should be cleaned every day and well iced. Doors should be kept closed to conserve refrigeration. Meat should not be stored in the ice compartment and never in contact with ice as the ice may not be clean, also the meat will become wet and this hastens spoilage. Drain pipes should be sanitary and open. Food compartments should not be overcrowded and meats should be unwrapped and so placed as not to retard circulation. Other foods should not be placed under or in contact with meat. The temperature of a refrigerator should be maintained below 45° F. A good thermometer should be used in each refrigerator.

Temporary camps. In temporary camps, meat and meat and dairy products may be stored for a short time in watertight containers and immersed in springs, or streams, care being taken to prevent contamination. Food may also be placed below the surface of the ground in underground ice boxes.

Disease transmission. Any disease, the causative organisms of which can be conveyed by food to a point of invasion within the body, may be transmitted by food. The diseases most frequently transmitted in this manner are those belonging to the intestinal group such as typhoid fever, the food infections, dysenteries, and diarrheas, but food may also be the transmission agency for other diseases such as tuberculosis, scarlet fever, and diphtheria. Diseases due to a pre-formed toxin, of which botulism is an example, may be caused by food in the sense that the food carries the toxin from the point of origin in infected food to the alimentary tract of man.

Meat poisoning, botulism. The inspection of meat offers but little safeguard against

the meat poisoning group of bacteria and botulism, or sausage poisoning, for the reason that the micro-organisms may pervade the meat without in the least changing its appearance, color, flavor, or odor. Thorough cooking will destroy the infection and eliminate the danger of meat poisoning and botulism but the cooking must be thorough and it must be remembered that the *bacillus botulinus* grows well in cooked foods.

Sanitary Inspections of Meat. Assuming that all prior inspections have shown the product to be acceptable up to the point of issue to the consuming organization, a further and final safeguard is essential in order to assure that deterioration or contamination has not occurred subsequent to issue and prior to consumption. This is accomplished by the sanitary inspection of products exercised by the responsible medical officer. The sanitary inspection within the company or organization mess should include the appearance of a package or product as an indication of prior handling, evidence of prior official inspection, as well as evidence of contamination, deterioration, and adulteration. Inspecting officers should be familiar with the appearance, color, odor, flavor, consistency, and other factors in order to determine acceptable sanitary conditions.

Color. The color of fresh meats depends mainly upon kind, age, conditions at slaughter, and part of the carcass from which derived. Choice fresh beef should be a bright cherry red; veal should be pinkish brown; mutton, a dark pink or red; lamb, a light pink, and pork, a light pink.

Odor. Meat should be free from any abnormal odor. Decomposed meat may be detected if it has a strong, sour, disagreeable, musty, mouldy, or other off color. Putrid odors are usually due to ammonia or hydrogen sulfide. Rancidity of fats may be determined by the odor or flavor. A steel trier or knife may be used as an aid in the examination for odors, passing the trier into the tissue especially in the vicinity of bone and withdrawing for evidence of decomposition.

Consistency. Sound meat should be reasonably firm to the touch and should barely moisten the finger. Meat should not be flabby or pit on pressure. If upon examination, meat or meat food products are found to be affected with an unsoundness of slight or limited extent, which in the opinion of the inspector can be removed by trimming, wiping, or other manipulation, this action should be taken followed by reinspection to determine condition of the product. If the unsoundness involves any considerable proportion of the carcass or cut and in all doubtful cases, the carcass or cut should not be used for food. The removal of surface rancidity or sourness may be accomplished by wiping with a dilute vinegar or baking soda solution.

Cured meats. Cured meats showing deep tissue decomposition, insect infestation, rancidity, sourness, or extensive mold or slime should not be used for food. Slight degrees of mold or slime may be removed by washing or wiping the surface with a dilute vinegar or soda solution.

Canned meat foods. Canned meat foods should be examined carefully for evidence of defective containers allowing contamination of the contents or of improperly processed contents resulting in spoilage dangerous to health. Defective cans are readily detected and are classified as leakers, swellers, or springers (AR 40-2200).

Leaker. A leaker is a can presenting a defect through which air may enter or the contents escape. If the defect is small, leakage may be indicated only by the removal of the vacuum and the disappearance of the concavity in the ends or sides of the can.

Sweller. A sweller is a can which contains gas in sufficient quantities to produce bulging or distention of the sides or ends. The gas is usually due to contamination with gas-producing organisms resulting in incomplete sterilization or infection subsequent to sterilization.

Springer. A springer is a can in which gas within the can is sufficient to cause a disappearance of the normal concavity from one end or side. External pressure on the flattened or bulging side causes the other end or side to flatten the bulge.

All leakers, swellers, and springers should be rejected for food. Canned food showing any evidence of spoilage such as off colors, decomposed portions, foul odors, etc., should not be used for food or even tasted. Botulinus toxin may be accompanied by a foul rancid-butter odor, but dangerous quantities of the toxin may be present even in the absence of such odors.

Poultry and Eggs. The term *poultry* includes chickens, ducks, geese, turkeys, and such other domestic birds as may be used for food. Poultry is generally subject to the same kind of contamination as meat products, though the tissues of poultry may afford a more suitable medium for the growth of organisms. While the diseases common to poultry are not readily communicable to man, very careful post mortem inspections are necessary in order to prevent the consumption of food contaminated with organisms pathogenic for man.

Inspection. Poultry will usually be received freshly killed, chilled, or frozen and should be undrawn,

with head and feet on unless processed under supervision of Federal inspection agencies when they may be accepted fully drawn. Evidence of decomposition, slimy or sour carcasses, or any other unsoundness render the carcass unfit for food.

The term *egg* usually includes only chicken eggs and while they do not ordinarily serve as a transmitting agency for disease-producing organisms, it is possible for micro-organisms to pass through the porous shell or reach the interior through a break in the shell.

Inspection. Eggs are inspected for freshness, soundness, cleanliness of the shell, color, and size. Candling and breaking are used to test the freshness or soundness of eggs. In candling, the unsoundness is indicated by mixing of the white and yolk, adherence of the yolk to the shell, blood rings, abnormally colored yolks, movable air cells, discolored whites, or foreign bodies. Unsound eggs should not be used for food. If, upon breaking, a considerable proportion are unsound, the entire lot should be discarded. An efficient candling apparatus may be easily constructed by placing a lamp or electric light bulb in a can, shoe box, or other receptacle through which has been cut a hole about the size of the small end of an egg. The egg is placed to this hole through which the light shines allowing the inspector to determine the internal condition of the eggs.

Fish and Sea Foods. From the time *fish* are caught until finally consumed they should be handled, transported, and stored under proper and sanitary conditions. Otherwise rapid deterioration characterized by putrefactive decomposition will occur. The flesh of fish may contain chemical poisons which will produce illness in man or it may serve as a transmitting agency for disease-producing organisms. Most of the fish so affected are found in the tropics. The toxic substance is usually found in the ovaries and eggs but may also be found in the head and liver. Inasmuch as the toxic substance is not removed by cooking, the most careful supervision must be exercised to assure the removal of these portions of the fish. In some localities, various types of fresh water fish (pike, perch) may contain the encysted larvae of the fish tapeworm which, when ingested in a viable state, develop into the adult forms in the intestines. Thorough cooking will destroy the larvae. Smoking, drying, salting, or freezing will not destroy the larvae.

Sound, fresh fish which have been properly handled and packed in ice may be held in storage at a temperature of 32° F. for 10 to 14 days. However, strictest care should be exercised to prevent variation of temperature. Should fish be defrosted they should be consumed promptly. Fish should be defrosted gradually in a cooler or refrigerator and not exposed to heat or soaking in either hot or cold water as this action will lessen the palatability and food value.

Inspection. In the inspection of fresh chilled fish, certain characteristic indications of soundness should be sought. If a fish is fresh and sound, the following conditions will be noted:

Gills. Bright red, usually closed, no abnormal odor.

Eyes. Prominent appearance, transparent cornea.

Scales. Adherent.

Skin. Free from malodorous slime, not discolored.

Flesh. Firm, only transient indentations by pressure with fingers.

Body. Stiff, tail rigid.

Carcass. Will sink in water.

The carcass of any fish showing evidence of unsoundness, injury, or contamination should not be used for food.

Many individuals exhibit idiosyncrasies to *fresh shellfish*, such as oysters, clams, crabs, shrimp, etc., which are usually manifested by urticaria, nausea, and vomiting. These symptoms should not be confused with those of food poisoning.

Inasmuch as oysters thrive best in water, the salinity of which is less than sea water, many of the producing areas are located where the sea water is diluted with fresh water. Some of these areas may be contaminated with the effluents of sewage systems. The production and handling of oysters are governed by State laws and regulations insofar as factors which result in contamination, deterioration, or adulteration are concerned and the shipment in interstate commerce is prohibited by Federal laws. The use of oysters or other sea foods should be confined to products handled under jurisdiction of State or Federal agencies. Oysters or other shell fish foods should not be served without cooking.

Inspection. Oysters may spoil or become stale after being shipped or they may become contaminated during transportation. Hence, a piece inspection should be made for evidence of spoilage, staleness, or adulteration. Oysters whether in the shell or shucked are highly perishable. They deteriorate rapidly when improperly handled and present a characteristic, disagreeable odor or a gassy or milky appear-

ance. Oysters may show a green or pink discoloration and while there is no evidence that they are detrimental to the health of the consumer, they are generally regarded as undesirable for food and should not be used. Ordinarily, only canned crabs, clams, shrimps, and lobsters are used in Army messes, but should they be furnished fresh, the inspection is, in general, the same as for oysters.

It is considered that all *canned sea foods* have been prepared under official supervision of civilian or military inspection agencies and that the quality of product and method of processing are satisfactory. However, deterioration of the canned product is subject to spoilage or damage and the product should be subject to sanitary inspection prior to use.

Inspection. The inspection is made by examination of the unopened can and the contents of suspected or selected cans. If the contents of the can are sound, the ends of round cans and the sides of square or flat cans are concave. Should the ends or sides become flattened or bulged, it may be due to a defect in the can allowing air to enter, or to decomposition of the contents with gas formation. Cans presenting defects through which air might enter or contents escape or which "bulges" or "swells" as the result of gas formation should be rejected for food. Upon inspecting suspected cans, care should be taken when opening the can not to damage contents. The contents should be carefully examined for abnormal odor, appearance, or taste indicative of decomposition. The inside surface of the can should be inspected for evidence of black discolorations due to chemical reaction. Any abnormal odor or appearance should be considered as indicative of decomposition and as a cause of condemnation.

Milk and Dairy Products. *Milk* is a most important agency of transmission for certain pathogenic organisms. It is usually served in an uncooked state and, consequently, many of the organisms which it may contain will be viable when ingested, therefore strict sanitary supervision during all stages of production is essential. When possible, the use of milk should be confined to establishments operating under supervision of the Army veterinary inspection service. A dairy farm examination consists of an investigation into the sanitation of the dairy farm establishment and all parts, equipment, employees' health and hygiene of dairy animals, methods of operation, and products concerned.

Inspection. Under certain conditions it may be necessary to investigate the conditions under which milk is produced. All bovines on the dairy farm should be free from disease as shown by a thorough physical examination conducted by a qualified veterinarian. The barns should be well ventilated, providing at least 3 square feet of window space and 500 cubic feet of air space for each animal. Manure must be removed and disposed of in such a manner as to prevent fly breeding. All milking utensils must be of non-absorbent material, in good repair, and properly sterilized. Milk must be promptly cooled within 1 hour after milking to 50° F. and maintained at or below that temperature until delivered to the pasteurizing plant (AR 40-2230). All personnel concerned with milking or handling of milk should be familiar with the necessity of strictest sanitary precautions and be required to undergo careful periodical physical examination to assure freedom from contagious or communicable disease.

Pasteurization is the heating of all particles of milk or milk products to a temperature of not less than 143½° F. and holding at such temperature for not less than 30 minutes in approved pasteurization apparatus. The hygienic condition of fresh milk depends to a considerable degree upon the conditions existing at the source of supply. Insanitary milk due to diseased animals or contamination at the source is correctible only in part, therefore it is necessary that milk be obtained from healthy cows and produced and handled under hygienic conditions even when it is pasteurized.

Inspection. Inspection of pasteurizing plants requires, in addition to a thorough knowledge of the pasteurizing process, an adequate understanding of the equipment, its construction, installation, and operation. Pasteurizing plants should have in satisfactory operation vats or holders in which the temperature of the milk is raised to at least 143½° F. and held for 30 minutes, automatic devices for registration of the pasteurizing temperature, coolers wherein the milk may be rapidly cooled to 45° F. or less after pasteurization, automatic bottling and capping machines, automatic bottle washers, and facilities for cleansing and sterilizing all parts of the pasteurizing equipment with which the milk comes in contact. All milk bottles should be sterilized before being filled and all pasteurizing equipment sterilized immediately before being used. Cleanliness throughout is essential in the operation of a milk plant. Pasteurization plants should be efficient and meet all sanitary requirements as to construction, equipment, personnel, products, and methods of operation. An ample supply of safe water and steam for cleansing and disinfecting purposes is essential. Doors, windows, and other openings should be screened and kept in good repair.

Milk issued to troops for beverage and cooking should be grade A pasteurized. When this is not obtainable, grade B pasteurized milk may be used. The use of bulk and raw milk should not be countenanced. If grade A or grade B pasteurized milk is not available, evaporated milk should be used.

Inspection. Samples for bacteriological and chemical analysis should be frequently obtained for laboratory tests. These should be packed in ice and promptly transferred to the laboratory. If

laboratory facilities are not available locally, a sample should be furnished corps area laboratory for analysis (AR 40-310). Use a sample of 1 quart of milk and pour it 25 times between sterile containers. Then add 1 cc of commercial formalin to the quart of milk and agitate thoroughly. Fill sample bottle flush with lower end of stopper and fasten securely. Label specimen, furnishing following information: Station from which sent, date of collection, nature of specimen, specific examination required, name of establishment from which milk was obtained, and the word "formalized."

Milk should be placed in clean refrigerated storage at a temperature of 45° F. promptly upon receipt. Underground ice or cooling box may be utilized for short storage periods. Bottled milk should not be submerged in water for cooling because the contraction of the contents accompanying the cooling process may create a sufficient vacuum within the bottle to suck in water around the edge of the cap resulting in possible contamination.

Condensed milk is primarily fresh milk from which a part of the water has been removed and to which sugar may or may not have been added.

It should be stored at temperatures below 60° F. and above freezing and the cases should be occasionally turned in order to offset the tendency of the fat to separate and of the milk to solidify. Long storage is undesirable due to tendency of acid content of milk to react on metal of the container producing off flavors, solidification, or swells due to hydrogen gas.

Inspection. Deterioration of condensed milk is evidenced by the formation of gas, the development of abnormal tastes or odors, or by discoloration. Cans presenting the above conditions should be rejected for food. Certain of the constituents of milk may settle out to form precipitates, however, this does not necessarily indicate that the milk is unsuitable for food. Such supplies should, however, be very carefully examined for evidence of other conditions which would render the product unfit for food.

Butter is the fat derived from milk or sweet or sour cream, formed into a mass together with water and small amounts of other natural constituents of milk, such as curd, lactose, and acid. It is essential that the production of butter be safeguarded in the same manner as the production of milk.

Butter exhibits a marked tendency to absorb odors and tastes from other substances and for this reason should not be stored in the same place or close to odorous substances such as fish, cheese, or certain vegetables. If butter is to be held for any considerable length of time it should be placed in *cold storage* at a temperature of from 5 to 10 degrees below zero F. where it may be held for as long as 6 months without deterioration. Butter should not be held at temperatures of from 20° F. to 30° F. for longer than 1 month and storage space should be kept dry and clean.

Inspection. Sanitary butter should be clean, sweet, of an agreeable aroma, palatable, of fine texture and grain, and should not contain adulterations, insects, or foreign substances. It is bright in color and of a light straw shade.

CLEANING AND DISINFESTING DEVICES

Bathing Facilities. Ablution benches where the men can wash should be constructed half way between the latrines and the company tents. These benches need not be very elaborate, but the drainage from them should be carefully planned so as to be well spread over the ground in a system of branching trenches and ditches. Improvised shower baths may be made out of five-gallon gasoline cans or from a barrel (Plate 18). All pits, ditches, and bathing areas as mentioned above should be at least 100 feet from any source of drinking water.

Laundry Facilities. Soldiers should be encouraged to keep their clothing clean, especially underwear and socks. In over night camps or bivouacs of short duration the men wash their clothing at designated places in nearby streams. In camps of longer duration laundry benches should be provided. The same care of drainage water should be taken as that described above for bathing.

Every opportunity should be taken to dry wet clothes. Socks may be hung on the outside of the pack while marching. Tents with stoves should be strung with wires or a screen of burlap erected around the stove, inside of which wet clothes are hung. If possible all clothes should be dried in the sun, especially socks, in order to destroy fungus growths (athlete's foot).

Disinfection may be required in some instances. Large steam disinfectors are sup-

plied to large commands. These consist of big pressure sterilizers or autoclaves, weighing some nine thousand pounds, mounted on iron wheels, in which at least one atmosphere of pressure may be developed. See discussion under "Lice", Chapter IV.

Sanitary Survey and Report. A sanitary survey is a study of the conditions of a military camp or post which are either favorable or unfavorable to the health of its personnel. A sanitary report is the summarized information obtained from a sanitary survey, including conclusions and recommendations as indicated.

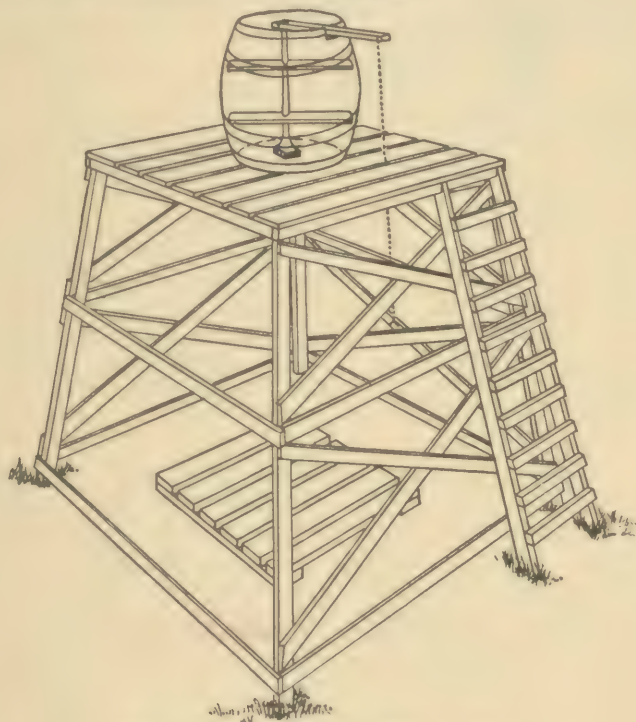


Plate 18. Improved Shower Bath.

Sanitary surveys have three functions. The first is to learn—to collect information. The second is to teach—to inform the commander and others as to the sanitary conditions and to spread the idea that good health is possible and that a healthy army is a strong army. The third is to utilize the collected facts as a basis for action, as a means for discovering sanitary short-comings, and as a guide in making recommendations for improvements.

Certain basic features of any community or military post must be considered: social factors, economic conditions, environmental conditions, and local prevalence of diseases. The health of a command is influenced a great deal by the health conditions of its adjacent civilian population and community. Personal inspection and study must be given to all these considerations, and a physical inspection of the sanitary installations and factors affecting sanitation of the command must be made. A definite scheme of making the survey should be written or thought out clearly before attempting it. Information should be secured from local health authorities, visiting civilian physicians, hospitals, dairies, packing houses, water supply and purification plants, and sewage disposal plants.

Features which can be improved by the command should receive closer study. The proper recommendations are then made. Defects and deficiencies of military installations can usually be corrected.

The medical officer making a sanitary survey does not possess the authority to order the institution of corrective measures except when such authority is delegated to him

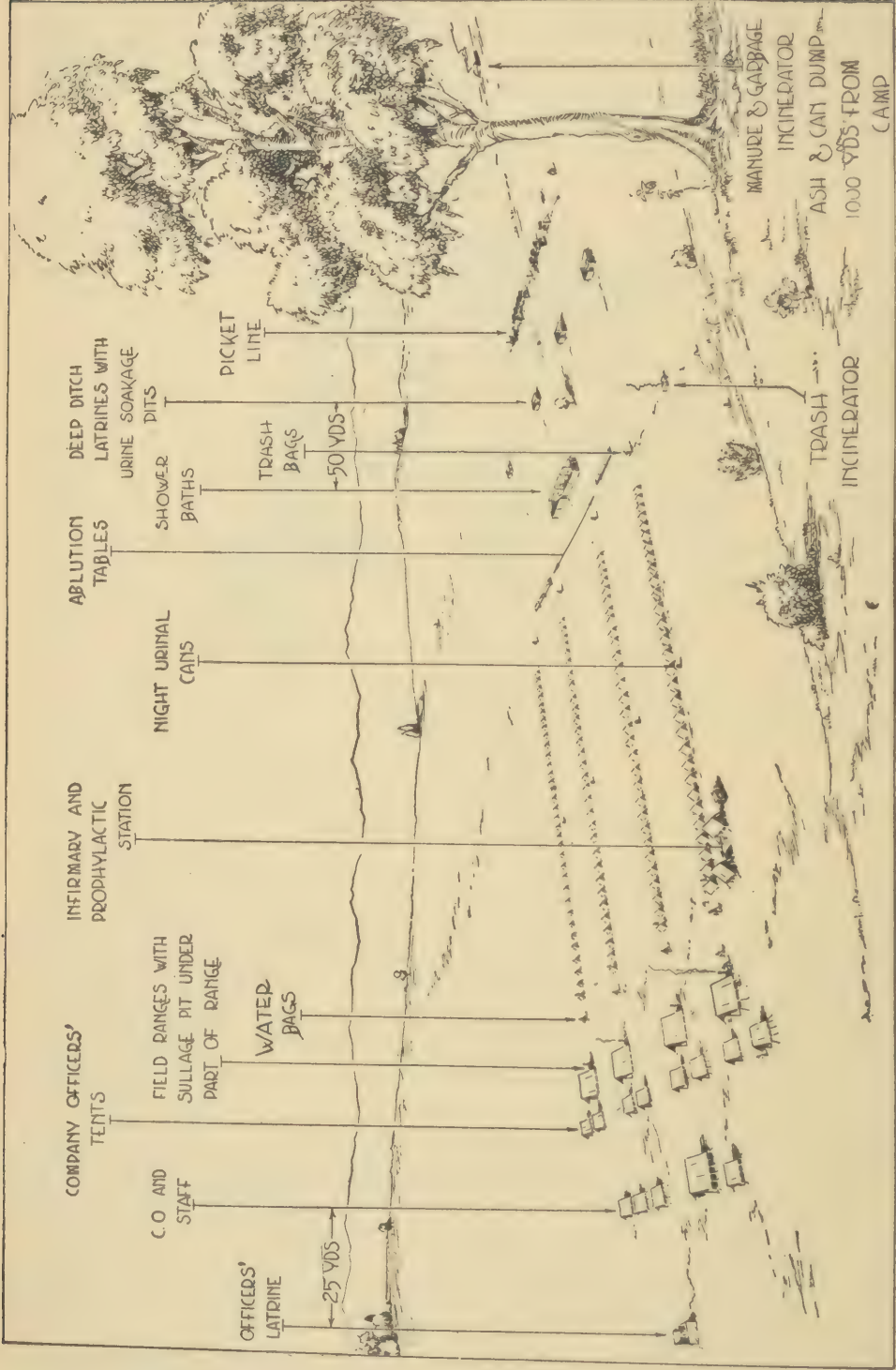


Plate 19. Diagram of a Proper Sanitary Layout for a Battalion Camp.

by proper military headquarters. His function is advisory and not one of command. The report may be either oral or written. There are several types of sanitary reports; **special, monthly, and general.**

Special reports: Special reports cover occasional emergencies, usually in written form, and will be rendered as necessity demands. Their purpose is to place immediately before commanding officers information regarding grave sanitary defects, epidemics, or other serious conditions that are affecting or may immediately affect the health of the command. In all such reports appropriate recommendations for the correction of existing defects or for prevention of extension of epidemics or threatening epidemics should be incorporated.

Monthly reports: Monthly reports are rendered for each station or tactical command in the field within three days after the end of each month. The purpose of the report is to keep the commanding officer and higher administrative authorities in touch with current sanitary and health conditions within a station or command and with defects which may influence the health of the command. To insure uniformity the following headings, numbered serially, are used in rendering these reports:

(1) **Environmental sanitation:** This includes any changes or additions to drainage system, public buildings water supply, disposal of wastes, food supplies, methods for eradication of disease-bearing or other insects, or other matters connected with environment that have occurred during the month. If no changes have occurred, the statement "Satisfactory" will suffice.

(2) **Personal hygiene:** Report of physical inspections as to whether or not there are new cases of venereal diseases. The status of immunological procedures should be included.

(3) **Undue prevalence of acute communicable diseases:** Report epidemics or epidemics of any of the acute communicable diseases that may occur, their origin, the means of probable dissemination, and special measures instituted for their control. If none, the statement "None" will suffice.

(4) **New or improved administrative measures and sanitary appliances:** Report improved or new sanitary appliances, health conservation or administrative measures of proven or potential practical value, either in garrison or on field service. If these have been the subject of special reports, attach copies thereof. If none, the statement "None" will suffice.

(5) **Subjects not covered under other headings.**

(6) **Recommendations:** Recommendations must be made for correction of all sanitary irregularities, for the improvement of existing or the institution of new appliances or for the adoption of administrative measures for the protection of the health of the command. If there are none, the statement "None" will suffice.

The veterinary sanitary report, the report of the nutritional status of troops, and the reports of the venereal disease control officer are not rendered as separate reports, but are incorporated in the one monthly sanitary report.

General report. The purposes of general reports are to inform higher authorities regarding sanitary conditions and related matters as viewed by medical inspectors of corps, department, or tactical command, or by general medical inspectors. They contain facts, conclusions, and recommendations concerning efficiency of Medical Department administration and personnel, care of equipment, sufficiency of hospitalization, and other allied subjects.

Disposition of Sanitary Reports. The final dispositions of the above reports in addition to the file copy retained of each at the originating command are as follows:

Special: To station or other commander send two copies; file one copy as an exhibit to go forward with the monthly report.

Monthly: Send in duplicate to The Adjutant General through channels.

General: Original through inspector's immediate superior to the Surgeon General and in duplicate to the station commander.

Sanitary reports are very powerful instruments in maintaining a high degree of sanitary efficiency and excellence.

Sanitary Order. Upon arrival in camp a camp sanitary order is necessary in order to designate the layout of the various sanitary devices in their relation to the rest of the camp's interior economy, as well as to lay down the sanitary rules and regulations by which the life of the camp is to be governed. Plate 19 shows a suitable layout for a battalion camp with its sanitary devices and the correct distances from the tents at which each is established. Terrain features will not always permit such an arrangement.

The camp sanitary order is usually drawn up by the senior medical officer of the command and by him submitted to the commanding officer who publishes it as an order. In general it fixes the responsibility for sanitary conditions in the camp, outlines the status of the surgeon, designates proper inspectors and police officers, lays down the rules governing the water supply and sterilization of water, and the conduct of messes together with the handling of food and the control of permanent food handlers, outlines the methods for the disposal of wastes and human excretions, the disposal of manure, the control of insects, the disinfection of clothing, the care of tentage and quarters, the location and function of the venereal prophylactic station, the periodic physical inspection of troops (Army Regulations require a monthly physical examination in which the detection of concealed venereal disease is only a part), enjoins observance of the rules of personal hygiene, designates the location of the medical tent or dispensary, and gives such other information or instructions as may be required for the preservation of the health of the command.

A detailed outline of the contents of a camp sanitary order, with references to pertinent Army Regulations, appears below:

Headquarters	Inf.,
Camp	
Place	
Date	

General Order

No.—

1. *General.* The following provisions for the sanitation of this command are published for the information and guidance of all concerned:

- a. Responsibility of the unit commander for the sanitary conditions of the command.
- b. The surgeon of the command: Duties and responsibilities in all matters relating to the health of troops and sanitation.
- c. The medical inspector: Authority and general duties. His reports to be made direct to the surgeon of the command. The general police officer when one is designated. His relation to the surgeon and to the medical inspector of the command.
- d. Water supply: Where obtained for drinking purposes, cooking, watering of animals, bathing and washing of clothes. Only water from authorized sources to be used. Flagging of streams. Installation, care, and protection of water sterilizing bags. Chlorination of water. (Par. 10, AR 40-205.)
- e. Food and messes: Food, messes, mess halls, and kitchens. Responsibility for. Preservation of food and foodstuffs. Cleanliness of all food handlers, utensils and fixtures in all kitchens, messes, bakeries, exchanges and welfare huts. Mess kit washing. (Pars. 11, 12, 13, and 14, AR 40-205.)
- f. Waste disposal: Separation and disposal of all wastes, garbage, rubbish, and tin cans. By whom removed, time of removal, and method to be employed in final disposal. Incinerators, type to be constructed, number, location, size, and how to be used and cared for. (Par. 15-16, AR 40-205.) Disposal of human excreta. Location of, type, number, and size of latrines to be used and constructed. Location, type, number, and size of urine soakage pits to be constructed. The use of urinal cans during the night hours. Responsibility for the care and cleanliness of all latrines, night urinal cans, and soakage pits. Burning, sunning, and airing. Treatment with chemicals, general policing. Latrine guards. (Par. 16, AR 40-205.) Disposal of manure. Location, care, and cleanliness of the picket lines and corrals. Removal and disposal of manure. Time of, by whom accomplished, and how finally disposed of. (Par. 17, AR 40-205.)
- g. Quarters: Superficial floor space and cubic air space per individual. Space between beds. Care of the floors, orderliness and cleanliness. Ventilation, exposure to sunlight, airing of all bedding and clothing. Overcrowding. Arrangement of beds for sleeping and relation to one another. (Par. 19, AR 40-205.)
- h. Insect control: Fly prevention; destruction of breeding places. Materials to be used in the prevention of fly breeding. Destruction of flies. Fly traps and fly bait. (Par. 21 AR 40-205.) Mosquito prevention; survey of the entire area. Establishment of proper drainage. Treatment of water holes, stagnant pools, and low ground near slow running streams. Methods to be employed in the prevention of breeding and destruction of mosquitoes. Protective measures to be taken by the command. Screening. (Par. 20, AR 40-205.)
- i. Personal hygiene: Washing of hands, bathing, and the washing of clothes. Shaving and cutting of hair. Care of the feet. Fitting of shoes and socks. (Pars. 7, 8, 9, AR 40-205.)

- j. **Dispensaries:** Establishment, location, and how marked by day and night. Time and place of sick call.
- k. **Venereal prophylaxis:** Location of stations, number of, and how marked by day and night. (AR 40-235.)
- l. **Physical inspection:** Time and place. Examination of all troops upon arrival and departure from camp. Immunization, character, time and place. (AR 40-215 and AR 615-250.)
- m. **Special measures for control of communicable diseases:** Detection of disease; presence in camp of first case is source of all trouble. Cooperation of all officers and men is required. (Par. 2, AR 40-205.) Disinfection and disinfection treatment of individuals. Treatment of clothing and bedding. (Pars. 22 and 23, AR 40-205.)
- n. **Civilians.** All civilians and civilian organizations attached to this command will comply with this order in so far as it applies to them.

By order of

Official:

Adjutant.

Distribution:

General.

Vital Statistics. The Medical Department officer in the field has to be familiar with elementary statistical methods as there are certain reports which require, not only the reporting of the absolute number of cases, but the rate of occurrence.

A *statistical rate* is the number of times an event occurs in a definite number of people during a given period of time. In order to calculate a rate the following must be known.

- (1) Frequencies of the event (cases, deaths, etc.).
- (2) Strength.
- (3) Period of time.

Army vital statistics are figured as rates per 1000, that is, a strength of 1000 is used as a base. In other places 10,000 or 100,000 may be used, but it is best to use the same figure at all times in order to make rapid and accurate comparisons.

In addition, Army rates are estimated on an annual basis. That is, a rate of so many cases per 1000 per annum. If in a command of 1000 men there are 10 cases of measles during any one month and the rate per 1000 for the year is desired, the 10 would be multiplied by 12. The result in this case would be 120 and as there were 1000 troops, the rate would be 120 per 1000 per annum. Here we have assumed that the same number of cases would occur during each of the remaining eleven months of the year. In most cases the strength is not in even thousands so additional calculations are required.

By *strength* is meant the number of individuals present at a certain time or during a certain period. To obtain the average strength of a command for a given number of days, the strengths for each day are added and divided by the number of days in the period, the result being the average strength.

Methods of Computing Rates and Ratios. The following formula will be found valuable in *computing rates* per 1000 per annum for any period:

$$\frac{\text{Number of events in the period} \times 1000 \times \frac{\text{One year (expressed in days, weeks or months),}}{\text{Mean strength} \times \text{Number of days, weeks or months in the period}}}{}$$

To illustrate, suppose there were 12 cases of measles in a command of 610 in a 5-weeks' period. What is the rate per 1000 per annum?

$$\frac{12 \times 1000 \times 52}{610 \times 5} = 204.5$$

Here the number of events (cases) is 12 and this is multiplied by 1000 and by 52. The figure 52 represents one year expressed in weeks. This result is divided by the strength multiplied by 5 (the number of weeks in which the 12 cases occurred).

Suppose these cases had occurred in one calendar month, then

$$\frac{12 \times 1000 \times 12}{610 \times 1} = 236.0$$

In this case the year is expressed by 12, the number of months in one year, and the strength is multiplied by one, there being one month in the period.

If these events occurred, in say 18 days, then the formula would be—

$$\frac{12 \times 1000 \times 365}{610 \times 18} = 398.0$$

Most of the morbidity records prepared by camp or station surgeons cover a 4- or a

5-weeks' period so that the first example shown here would be the one to follow.

For a more extended discussion see FM 8-55 or TM 8-255 (now published as Army Medical Bulletin No. 23).

The *noneffective rate* is a daily rate and is the number of men sick in hospital or quarters per 1000 strength on the day for which it is calculated. The noneffective rate is employed to determine the number of troops in a given command that are physically fit for duty on a given day, or the average daily noneffectiveness caused by a disease during a selected period of time.

The noneffective rate for a given day may be calculated as follows:

$$\text{Noneffective rate} = \frac{\text{Number of sick} \times 1000}{\text{Strength}}$$

The following formula may be used to determine the average daily noneffective rate for a period of more than one day:

$$\text{Noneffective rate} = \frac{\text{Sum of number sick daily} \times 1000}{\text{Sum of daily strengths}}$$

The following formula may also be used to determine the daily noneffective rate:

$$\text{Noneffective rate} = \frac{\text{Total days lost}}{\text{No. of days in period}} \times \frac{1000}{\text{average daily strength}}$$

Thus, if in a command of 500 troops, 10 men are sick on a given day, the noneffective rate is 20 per 1000 troops. It is calculated as follows:

$$\begin{aligned} \text{Noneffective rate per 1000} &= \frac{10 \times 1000}{500} \\ &= \frac{10,000}{500} \\ &= 20 \end{aligned}$$

If four cases of measles occur in a command of 500 troops during one month and these cases are sick for 10, 12, 14, and 14 days, respectively, the noneffective rate may be calculated as follows:

$$\begin{aligned} \text{Noneffective rate 1000} &= \frac{(10+12+14+14) \times 1000}{30 \times 500} \\ &= \frac{50,000}{15,000} \\ &= 3.33 \end{aligned}$$

Or:

$$\begin{aligned} \text{Noneffective rate} &= \frac{50}{30} \times \frac{1000}{500} \\ &= 1.666 \times \frac{1000}{500} \\ &= 1.666 \times 2 \\ &= 3.33 \end{aligned}$$

In 1928 the total United States Army, consisting of 134,380 troops, lost 73,144 days from duty because of influenza, or, as expressed by the noneffective rate, 1.49 men out of every 1000 troops, were incapacitated for duty each day of the year. This is determined by the following calculation:

$$\begin{aligned} \text{Noneffective rate per 1000} &= \frac{73,144 \times 1000}{365 \times 134,380} \\ &= 200.39 \times \frac{1000}{134,380} \\ &= 200.39 \times 0.00744 \\ &= 1.49 \end{aligned}$$

In the report of venereal diseases the *prophylactic rate* is required. That is, the number of men per 1000 strength who have taken venereal prophylaxis during the month. This rate is obtained as follows:

$$\text{Number of prophylactics administered} \times \frac{1000}{\text{Average daily strength}}$$

Ratios are used to express relationships between frequencies of occurrence of related events. Ratios are usually expressed in percent (per 100). A case fatality rate is the ratio of deaths from a specific disease to the number of cases of the disease. If during an epidemic of meningitis there were 120 cases and 30 of them died, the case fatality rate would be 25 calculated as follows:

$$\begin{aligned} \text{Case fatality rate} &= \frac{30 \times 100}{120} \\ &= 0.25 \times 100 \\ &= 25 \end{aligned}$$

CHAPTER IV

ESSENTIALS OF MILITARY PREVENTIVE MEDICINE

Definition. Military preventive medicine includes the measures which are necessary for the prevention and control of diseases among the members of military forces. It is comparable to the activities of the public health service of civilian communities, as modified by military environmental conditions. It has a definite and important role in the mission of the Medical Department.

The mission of the Medical Department is the conservation of man power—the preservation of the strength of the military forces. It accomplishes its mission by three methods; *first*, by accepting for the military service only those men who are physically fit; *second*, by keeping these men physically fit through the application of the principles of preventive medicine; and *third*, by restoring to physical fitness, as promptly as possible, through the application of curative medicine, those who become disabled.

Soldiers are subject to the same diseases as people in civil life. In some respects they encounter greater health threats. Their life demands concentration in compact military communities, with a resulting exposure to large doses of mixed and crossed infectious material. Their exposure to hardships and hunger, which lower their natural resistance, and to sudden changes of environment tends to make them more susceptible to the communicable diseases than would be the case under normal civilian conditions. Therefore, the medical officer must fortify his knowledge of curative medicine with the principles of preventive medicine. Basically, sanitation and hygiene are factors in preventive medicine and are necessarily included in the study of that subject.

Historical Background. In most wars the loss of military man power from disease has greatly exceeded the losses of men in battle. Even during the World War our losses from disease exceeded our battle casualties. History records many examples of important campaigns which have failed because of outbreaks of disease among the troops. The map of the world, as we now know it, undoubtedly would have been quite different if outbreaks of disease had not prevented military leaders from accomplishing their missions. Much of this enormous loss was due to preventable disease, before mankind emerged from a state of relative medical ignorance. It is only in recent decades that we have come to know much about the basic causes of the diseases that wrought such havoc among men assembled in armies and have devised ways and means to prevent such losses.

COMMUNICABLE DISEASES

Definition. The designation “communicable diseases” is used to cover all those infectious or contagious diseases transmitted from person to person by direct contact, indirect contact, or through some special transmitting agent. They are all caused by “germs” of one kind or another; in some, the specific germ is known, while in others it is not known. They are the diseases which, under favoring conditions, may appear in epidemic form.

Epidemics. An epidemic exists when a large number of persons in a community are affected simultaneously by a certain disease or suffer its effects within a short space of time. To have an epidemic outbreak of communicable disease three things are necessary:

- A focus, or source, of the disease.

- Susceptible individuals.

- Proper contact between the susceptible individuals and the source of the disease.

Classification of Communicable Diseases. Communicable diseases which affect military personnel may be classed for the most part under five general headings:

First. Diseases which are transmitted by the intestinal discharges and then acquired by ingestion of infected material. They are commonly called *food* or *water-borne* diseases. Included in this class are:

Amoebic dysentery (protozoal)
 Botulism
 Cholera
 Diarrhea (common)
 Dysentery (bacillary)

Food infection
 Parasitic infestations (helminthic)
 Paratyphoid fever
 Typhoid fever
 Undulant fever

Second. Diseases which are conveyed by the secretions of the mouth, nose, and throat of infected people and which gain entrance to the body of the uninfected through those portals. This method of transmission is commonly known as "droplet infection." These are the *respiratory diseases*. Diseases which can be placed in this class are:

Chicken pox
 Common colds
 Diphtheria
 Encephalitis (epidemic)
 Influenza
 Measles
 Measles (German)
 Meningitis (meningococcic)
 Mycotic diseases of the lungs
 Pneumonia (lobar and bronchial)

Pneumonia (secondary)
 Pneumonia plague
 Poliomyelitis
 Psittacosis
 Scarlet fever
 Septic sore throat
 Smallpox
 Tuberculosis (pulmonary)
 Vincent's infection
 Whooping cough

Third. Diseases which are dependent upon exposure to insects, known as the *insect borne* diseases as they are usually transmitted by blood-sucking insects. The diseases in this class are:

Bubonic plague
 Dengue
 Equine Encephalomyelitis
 Filariasis
 Leishmaniasis (oriental sore, es-
 pundia, and kala-azar)
 Malaria
 Pappataci fever
 Pseudotyphoid meningitis (Swine-
 herd's disease)

Relapsing fever
 Rocky Mountain spotted fever
 Trench fever
 Trypanosomiasis (African sleeping sick-
 ness and Chagas' disease)
 Tularemia
 Typhus fever
 Yellow fever

Fourth. The *venereal* diseases in which the infection is usually transmitted by direct contact during sexual intercourse. The diseases in this class are:

Chancroid
 Gonorrhea

Lymphogranuloma inguinale
 Syphilis

Fifth. Diseases requiring control measures not included in the above headings and which might be listed in two or more of the above classes are as follows:

Anthrax
 Beri-beri
 Infectious jaundice
 Leprosy
 Rabies
 Rat-bite fever

Ringworm (tinea cruris)
 Scabies
 Scurvy
 Tetanus
 Trachoma
 Yaws

The diseases for which *notification to Public Health authorities* is usually required in the states and cities of the United States are:

Actinomycosis
 Ancylostomiasis (hookworm disease)
 Anthrax
 Chicken pox (varicella)
 Cholera
 Conjunctivitis (acute infectious)
 Dengue
 Diphtheria

Dysentery (amebiasis)
 Dysentery (bacillary)
 Encephalitis (infectious, lethargic,
 and nonlethargic)
 Favus
 German measles (rubella)
 Glanders (farcy)
 Gonorrhea

Influenza	Scarlet fever (scarlatina)
Leprosy	Septic sore throat (streptococcal throat infection)
Malaria	Smallpox (variola)
Measles (rubeola)	Syphilis
Meningococcal meningitis	Tetanus
Mumps (parotitis)	Trachoma
Paratyphoid fever	Trichinosis
Plague (bubonic, septicemic, pneumonic)	Tuberculosis (pulmonary)
Pneumonia (acute lobar)	Tuberculosis (other than pulmonary)
Poliomyelitis	Tularemia
Psittacosis	Typhoid fever
Puerperal infection (puerperal septicemia)	Typhus fever
Rabies	Undulant fever (brucellosis)
Rocky Mountain spotted (or tick) fever	Whooping cough (pertussis)
	Yellow fever

Botulism, pellagra, food infections and poisonings, although not considered communicable, are also reported since they usually occur in groups or epidemics, and their prevention is practicable.

Diseases or infestations for which notification of Public Health authorities is not everywhere required are as follows:

Ascariasis	Pediculosis
Climatic bubo	Yaws
Coccidiodal granuloma	Rat-bite fever (sodoku)
Common cold	Relapsing fever
Filariasis	Ringworm
Ictero-hemorrhagic jaundice (Weil's disease)	Scabies
Impetigo contagiosa	Schistosomiasis
Lymphogranuloma venereum (inguinale)	Vincent's infection (angina, stomatitis)

Biological Sources. Every case of communicable disease comes from some other case of that disease; air, water, food, utensils, insects, and all other such means are merely the agents which carry the germs from the infected person to well persons.

Geographical Sources. The geographical source of the communicable diseases that play such an important part in the health of the soldier is the civil community from which he comes as a recruit or the civil community adjacent to the military community where he resides.

Areas at large. In a concentration of military man power some men arrive at the rendezvous while in the earliest or incubation stage of measles, mumps, or other communicable disease. In a few hours, or a few days, they will be sick. These men are unaware of their exposure, and until symptoms appear there is no way to foresee their impending sickness. In the meantime they are necessarily coming in more or less intimate contact with other men among whom will be a certain proportion who are susceptible to the disease in question. After a short time some of these susceptible contacts will become sick with this same disease; by that time an epidemic may have started and, unless vigorous measures are taken to stop it, it will continue until all the susceptible material has been exhausted. Such infections increase in virulence by being exchanged between individuals who have been unaccustomed to them.

Local areas. Men in a military community will naturally come in contact with people of the adjacent community. Many of the communicable diseases are present at all times in civil communities, and susceptible soldiers will almost certainly be exposed to such diseases, acquire them and, of course, introduce them into the military community with the results outlined above.

Methods of Transmission of Communicable Diseases. Communicable diseases are transmitted in three ways: direct contact, indirect contact, or by a special agent. A "*contact*" is a person (or animal) known to have been sufficiently near a source of infection presumably to have been exposed to the transfer of infectious material, either directly or from articles freshly soiled with such material. As a contact the person is considered a potential carrier of the disease, although he may not display the symptoms of the disease in question.

A *direct contact* transmission of disease occurs when a susceptible person comes in close or intimate physical relationship with a person sick with the disease in its infective stage. A few examples of diseases which may be transmitted by direct contact are: measles, mumps, smallpox, respiratory diseases, and the venereal diseases.

Transmission by *indirect contact* occurs where the susceptible person uses some article which has recently been used by a person sick with the disease in its infective stage. Some common examples of indirect transmission are: using towels, dishes, eating utensils, pipes, lighted cigars, cigarettes, and the like, that were in recent intimate contact with, or soiled by, the sick person. Influenza, as an example, may be spread by unsterilized eating utensils. The majority of the diseases transmitted by direct contact are also transmitted by indirect contact.

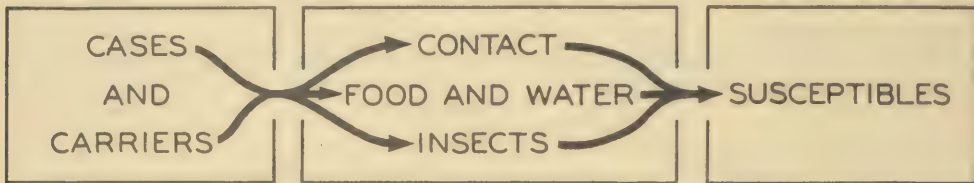


Plate 1. Factors in the Control of Communicable Diseases.

Transmission of communicable disease by a special transmitting agent occurs where the susceptible person's only contact with the sick person is through some intimate carrier of the germs of the disease. Examples of this mode of transmission of disease are: the mechanical transmission of typhus fever by lice, the biological transmission of malaria by the mosquito, and the transmission of typhoid fever by the healthy human carrier.

A "*carrier*" is a person who, without displaying visible symptoms of harboring a communicable disease, disseminates to others its specific micro-organisms. The diseases which are known to be transmitted by "*carriers*" are as follows:

Cholera	Paratyphoid fever
Diphtheria	Pneumonia
Dysentery (amebiasis)	Scarlet fever
Dysentery (bacillary)	Typhoid fever
Meningococcic meningitis	Vincent's infection

As distinguished from a "*carrier*," the term "*infected person*" designates a person in whose tissues the etiological agent of a communicable disease is lodged and produces symptoms.

Factors Influencing Communicable Disease. Several factors which may affect the severity and the dissemination of communicable diseases may be grouped into three general classifications: the degree of individual resistance to the given disease; the time of recognition, whether detected in the early stages of dissemination or after the exposure of many susceptibles; and the climate or environmental conditions which may enhance or adversely affect the individual resistance, or favor or limit the transfer of organisms causing disease from one individual to another.

Individual Resistance. Each person has a certain degree of natural resistance to infection by the communicable diseases. This resistance is relative, some having more than others. Resistance to disease is also "*general*" or "*specific*." The person of good physique and robust health is likely to have a good general resistance to many diseases. Specific

resistance, or immunity, applies to certain diseases and may be acquired in several ways, as related below:

First: By having suffered an attack of a disease which confers a degree of immunity which will protect the recovered individual from another attack of the same disease. Smallpox is an example of such a disease, because individuals who have recovered from smallpox have not been known to have smallpox again during their lifetime.

Second: By repeated exposure to small doses of infectious material by which a resistance is built up without the individual every being actually sick with the disease. Many individuals have been repeatedly exposed to diphtheria patients without ever contracting diphtheria themselves. It is believed that the exposure to small amounts of infectious material can be tolerated without developing the major symptoms of the disease. The presence of the infectious material, however, stimulates the formation of antibodies in the blood against the particular disease; and, if the next dose of infectious material is not too large, this antibody formation is increased even more. By this process being repeated several times, the individual apparently develops sufficient immunity to resist doses of infectious material large enough to produce severe symptoms in the unprotected individual. Measles, chicken pox, scarlet fever, and mumps seem to fit into this classification in respect to some persons.

Third: By artificial immunization by means of vaccination against a given disease. The immunization may be produced either by the introduction of the dead organisms or the toxic material of such organisms into the human body. Typhoid fever organisms, for instance, are cultured, then destroyed, and made into a vaccine which is inoculated intramuscularly. The presence of these dead organisms stimulates the antibody formation of the individual concerned, and for a period of several years he has an increased resistance or immunity to typhoid fever. Smallpox immunity has been definitely acquired by artificial immunization. Many other diseases have given favorable indications that they can be controlled or lessened in their severity through these means.

There are many other factors which contribute both to an individual's general resistance to disease or the lack of such resistance. Previous environment, age, vitality, and race are among the more recognized ones.

Previous environment has much to do with the amount of resistance to disease a soldier has acquired by the time he enlists into the military service. In general, recruits from populous communities have been more frequently and more intimately exposed to infective material of many kinds than those from thinly populated areas. For example, the recruit who has always lived in the city very rarely reaches adult life without having had measles, while the young man who has always lived on a farm, and has had very few contacts with people other than his immediate neighbors, may or may not have had measles.

Age is a factor in the resistance of an individual because as individuals mature they attain more and more resistance, reaching their maximum in late middle life. Age increases both natural and specific resistance—physical stamina is greater, and antibody formation has been under process for all diseases to which the individual has been exposed. When physical stamina becomes lessened materially, as in the later years of life, the general resistance is decreased in spite of immunities acquired.

Vitality is another important factor in disease resistance. Men who are weakened by lack of adequate and proper food, by exposure to wet and cold, by physical or mental exhaustion, by confinement in close quarters, and by lack of proper exercise, are apt to become sick from whatever communicable disease is prevalent, unless they have specific immunity to it.

Racial resistance to some disease is known to vary. The white race, for example, has a greater resistance to pulmonary tuberculosis than negroes. Malaria is said to be tolerated better by the negro than the white person. Part of this racial resistance is hereditary and part is environmental.

PREVENTION AND CONTROL OF COMMUNICABLE DISEASES

Purpose. Preventive medicine, which includes measures for both prevention and control of communicable diseases, is formulated and health measures executed in accordance with the mission of the military force. These measures should be correct, feasible, and practicable. They should not interfere with the accomplishment of the military mission of the command. If, however, there is an epidemic of a communicable disease in a command, the control of this disease would be of paramount importance in order to prevent the loss of valuable manpower. The early consideration and use of preventive measures will often provide a protective barrier against disease and prevent epidemics.

Preventive Measures. In addition to the natural resistance of the individual, there are many precautionary measures which should be taken in order to prevent the outbreak and spread of communicable disease. These measures may be divided into four general classes:

First. Providing an environment that will prevent or limit the dissemination of infective material: proper housing—ventilation, heating, lighting, and cleanliness; insect control; and rodent control.

Second. Measures designed to maintain the health and vitality of the soldier: proper food, clothing, exercise, rest, sleep, and personal hygiene.

Third. Specific prophylactic treatment to confer immunity; artificial immunization against smallpox, typhoid, tetanus, yellow fever, cholera, diphtheria, and other diseases against which specific immunity has been effective.

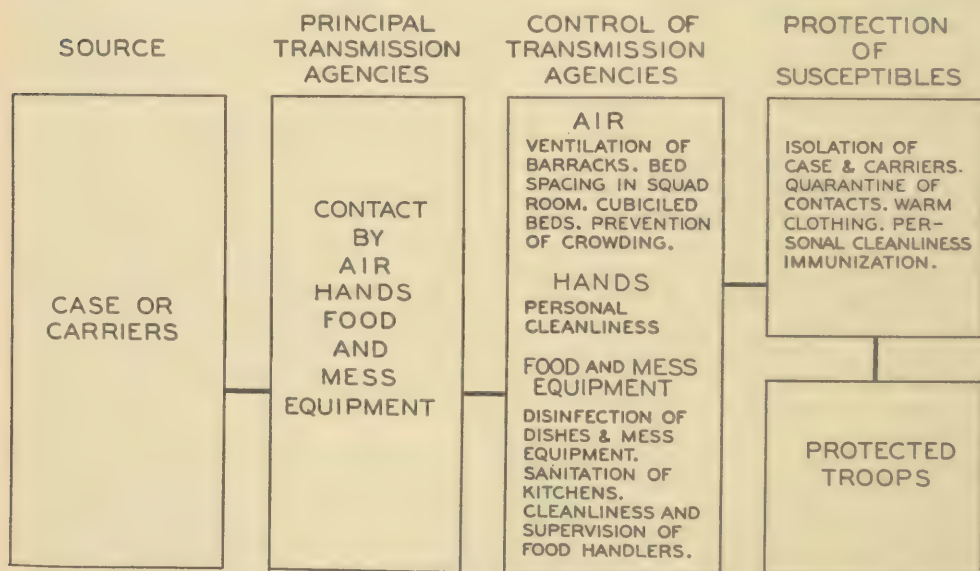


Plate 2. General Factors in the Control of Respiratory Diseases.

Fourth. The isolation of the sick, the quarantine of contacts, separating them from the well in order to prevent further spread of the disease. The effectiveness of this measure is dependent upon the early recognition and diagnosis of the sick.

Environmental Measures. A healthy environment is obtained by the proper housing of troops and the physical and chemical destruction of those pathogenic organisms that affect human beings directly or indirectly. The factors of housing involved in the prevention and control of disease are ventilation, heating, plumbing, screening, and lighting. The sanitation of the buildings occupied by troops is the responsibility of the unit commander; the construction and repair, and the ventilating, heating, and lighting facilities are responsibilities of the Engineer Corps. The medical officer of the unit makes recommendations based upon inspections in order to insure the observance of proper

sanitary measures and maintenance of conditions which will promote and preserve the health of the troops.

Ventilation. Adequate ventilation is obtained by the use of proper methods of heating, correct construction of buildings, and the avoidance of overcrowding. Ventilation of the squad room need not be a difficult procedure. If the prescribed bed space is used, and if beds are arranged head to foot (see Plate 3), the occupants of the room will not so readily transmit pathogenic organisms to one another. Sixty square feet of floor space for each bed and 600 cubic feet of air space per man should be allowed exclusive of space utilized for wall lockers, foot lockers, furniture, and fixtures. The windows should be opened on top on one side (leeward) of the squad room, and at the bottom on the opposite side (windward). This is the most effective method of ventilation in

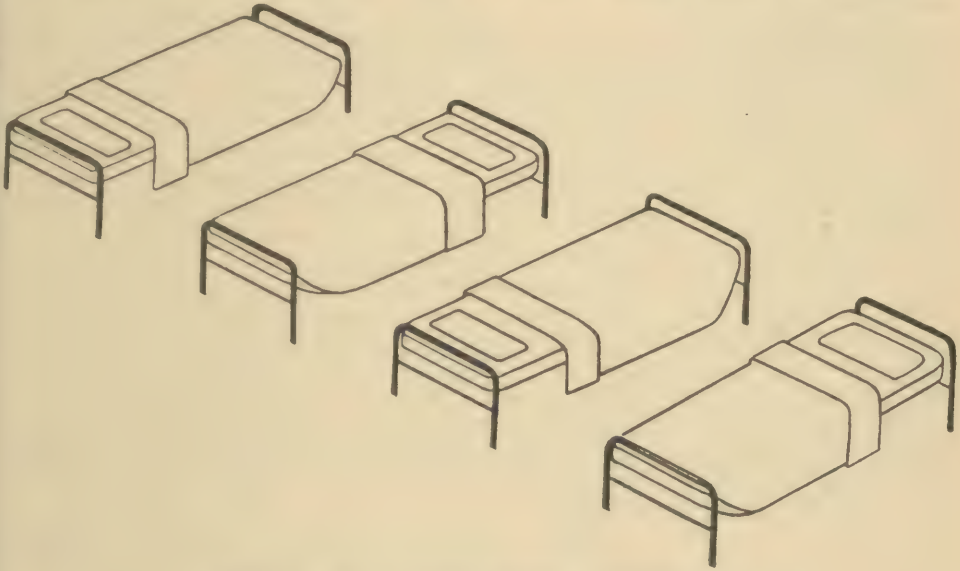


Plate 3. Head to Foot Sleeping Arrangements.

the ordinary squad room. Mechanical air conditioning methods are not employed, as yet, in the ventilation of barracks or quarters. They are occasionally installed for the ventilation of operating rooms in hospitals and in other special enclosures. It is not improbable that air conditioning will be used more extensively in the future to include barracks and other military establishments. Ventilating facilities should be adequate and used. Officers of an organization should inspect the men's sleeping quarters at night to see that they are well ventilated.

Most cantonment barracks as constructed at the present time are heated by hot air and depend for proper circulation of air on pressure within closed windows. The heating plant is located at the end or side of the building. Fresh air from outdoors is drawn in through the furnace where it is heated. A large blower fan then forces this heated air through air ducts opening in all parts of the building. Each opening has a damper whereby the flow of air may be regulated. Once regulated these dampers should not be changed. A large exhaust fan draws air through an opening near the floor and returns it to the furnace room. There a system of dampers permits a part of the air to be released outdoors and recirculates the remainder of the air through the furnace. All windows must remain closed to permit this system to operate efficiently. If windows are opened the distribution of air will be uneven and the furnace will be overtaxed. A variety of thermostats, dampers and switches makes this system requiring rather skilled operation. When the furnace is not in operation, ventilation is obtained by the conventional window system. This modification of the hot air furnace method of heating and

ventilating does not apply to the comparatively few cantonment barracks which have steam heat and in which the conventional window ventilation is always employed.

Overcrowding, though unavoidable at times, should never be condoned. It contributes to epidemics by increasing the number and intimacy of contacts, as well as by lowering the vitality of individuals. In extreme emergencies the minimum allowance may be reduced to 500 cubic feet of air space and 50 square feet of floor space per man.

Ventilation of tents used as quarters is also important. The hood of the tent should be open to allow air to escape. Side walls should be raised sufficiently to allow air to enter at the bottom of the tent. The tent walls should be rolled daily, permitting the interior to air thoroughly. The tent should be taken down, or furled, periodically and the interior exposed to direct sunlight. Sunlight has a definite bactericidal effect, and therefore when the interior of a tent can be exposed directly to sunlight the dissemination of bacteria is decreased.

Heating. Proper heating is the process of raising the temperature of cold air within quarters occupied by troops to about 70 to 72 degrees Fahrenheit with a relative humidity of 50 per cent, and then maintaining this temperature and humidity within the zone of comfort. The "zone of comfort" is that range of the combined effect of temperature, humidity, and movement of air within which there is no discomfort due to either warmth or cold. The term "effective temperature" as pertains to heating includes humidity and movements of the air. The optional effective temperature to provide the average winter comfort zone ranges from 63° F. to 71° F. The average summer comfort zone is somewhat higher, ranging from effective temperatures of 66° F. to 75° F.

Since physical efficiency is decreased by improper temperature, humidity, and movement of air (i.e., improper effective temperature), the air conditions of occupied quarters should be determined and then adjusted, if necessary, to insure maximum comfort. Upon entering a room a person can note at once the state of air conditions of which those who have been in the room for some time may be unaware. If improper a sense of discomfort is noted—stiffness, lack of freshness, excessive warmth. The temperature should be adjusted according to the work performed and the clothing worn by the individuals. Where soldiers are actively engaged physically, the effective temperature may be lower than where their duties are sedentary.

Light. Light aids health by providing a sense of brightness and cleanliness, stimulating morale, and increasing a desire to maintain hygiene and sanitation. Adequate lighting facilities should always be provided where men read or carry on clerical work. The continued use of poor light will cause impairment of vision. The minimum window (light) space for a squad room should equal about 20 per cent of the floor space, provided there is no obstruction to light entering the building by adjacent buildings or other external objects. Natural illumination is better than artificial light.

Housing sanitation or cleanliness. Improving the environment by the use of control measures to destroy or curb the activities of pathogenic micro-organisms injurious to man is important in preventive medicine. These measures include: cleaning or policing, disinfesting, disinfection, and fumigation.

Cleaning or policing a building signifies the removal by scrubbing and washing, as with hot water, soap, and washing soda, of organic matter upon which and in which bacteria may find favorable conditions for prolonging its life and virulence; also, the removal by the same means of bacteria adherent to surfaces. Painting a surface could be included in this class of cleaning measures. Rooms previously occupied by infected persons should be cleaned prior to admittance of other occupants.

Disinfesting is a process of destroying insects and animals which are known to be capable of conveying infection. The measures of destruction include the use of dry or moist heat, gaseous agents, poisoned food, trapping, and allied measures. "Delousing" refers to the process by which a person and his personal apparel are treated so that neither the adults nor the eggs of *Pediculus corporis* or *Pediculus capitis* survive. Men are required to bathe and shave; wearing apparel is steamed.

Disinfection is the process of destroying the vitality of pathogenic micro-organisms by chemical or physical means. It may be concurrent or terminal to the infection. The use

of a disinfectant, such as cresol solution, to scrub a bed which has been occupied by a person with a communicable disease is an example of disinfection.

Fumigation is the process by which the destruction of insects, such as mosquitoes and body lice, and animals, such as rats, is accomplished by the employment of gaseous agents. Hydrocyanic acid gas is the most effective agent of fumigation. Other agents quite commonly used are sulphur dioxide, carbon disulphide, and carbon monoxide.

Insect Control. Insect control is essential for the maintenance of health, especially in warm climates. They are factors in the transmission of disease serving either as hosts for certain diseases or as mechanical carriers of disease organisms.

Flies are the most common insects which are known to affect the health of humans. They are filthy in their habits and spread disease by transferring germs on their appendages or in their excretions from one place or person to another. In this way the house fly is capable of transmitting any of the pathogenic bacteria. The most common bacteria it transmits are the intestinal disease producers. The transmission of protozoal infestations *endameba histolytica* and *ascaris lumbricoides* may also be attributed to flies. Flies breed in and live on putrescent material of any kind—garbage, feces, manure, and other wastes. Fly control is best accomplished by the elimination of their breeding places. Adult flies are destroyed by fly traps, swatters, poisons, fly paper, and fly sprays. A fly is attracted by food and it is by means of contaminating food that most of the diseases carried by flies are transmitted to man. Therefore protection of food from contact with flies is important. Screening of windows and doors is necessary for both mess halls and barracks. The control of flies with respect to messing and field sanitation is discussed in Chapter III.

Mosquitoes spread certain communicable disease by furnishing a biological link between the person sick with the disease and a well person. Like flies, they are best eliminated by destroying their breeding places and habitations. As they must have water in which to breed, drainage of standing water, or oiling water that cannot be drained, destroys their breeding places. The elimination of tall grass and underbrush destroys their habitations. Screening of sleeping quarters and the use of mosquito bars (bed nets) should be enforced. For men on duty when they are subject to constant attack by mosquitoes head nets and gloves are a useful measure.

Diseases transmitted by mosquitoes are:

Dengue (*Aedes aegypti* and *Aedes albopictus*).

Equine Encephalomyelitis (*Aedes aegypti* and other member of the tribe).

Filariasis due to *Wuchereria bancrofti* (*Culex fatigans* and *Aedes variegatus*).

Malaria (*Anopheles*).

Yellow fever (*Aedes aegypti*).

The Medical Department is responsible for mosquito investigation, reporting of conditions which require mosquito control, and for recommendation of control measures. The Quartermaster Corps is responsible for materials. The Engineer Corps is responsible for construction, equipment, and labor, including the operation and maintenance of control measures. The Medical Department may act in an advisory capacity for technical procedures.

Chiggers or red bugs are very troublesome to our troops in the Southern States. They are the larvae or the first active stage of a large scarlet soil-inhabiting mite. The chiggers found in the United States are not known to carry disease but they produce extreme annoyance by their bites. The intense itching caused by these pests often interferes with sleep and the poison injected may cause fever and a loss of appetite. Infection is usually introduced as a result of scratching. Closely woven garments with boots worn over the trousers will exclude many of the chiggers. Leggings if properly fitted over the shoes offer much protection. Dusting the clothing and body, especially from the waist down, with sulfur gives almost complete protection. One should lightly dust sulfur on the skin, underclothes, and socks before going into chigger infested areas. The effectiveness of the sulfur increases after it has been applied for 2 to 3 days in succession, at which time it can be relied to give reasonably complete protection. Chiggers may be removed by a sharp instrument if detected early and before they are firmly attached. The bitten area should be touched with 7 per cent iodine.

Bedbugs are not definitely known to transmit any disease, but they have been accused of carrying kala-azar, plague, anthrax, relapsing fever and typhus. Both male and female bedbugs suck blood. They can live as long as nine months without food. They are very sensitive to temperature and are apparently more numerous in the cold than in hot climates. Fumigations of 6 to 12 hours' duration with hydrocyanic acid gas generated from 1 pound of sodium cyanide per each 1000 cubic feet of space have given excellent results in most barracks. To fumigate safely it should be done by trained personnel and buildings should be separated from other buildings by a distance of 15 to 20 feet. Liquid insecticides are effective against bedbugs if applied thoroughly and frequently and forced into places where the eggs are deposited. Power sprayers operated by electricity are best used for this purpose.

Roaches may be troublesome in mess halls and kitchens. It has been shown that disease organisms may be carried on the legs of roaches and that the same organisms can be found in their feces passing through the alimentary tract uninjured. For immediate elimination of roaches in tight rooms, fumigation as described for bedbugs, is very successful. Sodium fluoride powder is the best all around remedy. It remains effective indefinitely in dry situations but in very damp places it may cake over and become useless. The powder should be applied in the evening, and it is best not to clean it up for two or three days. Borax and pyrethrum powder or a pyrethrum kerosene spray is also effective, particularly if vaporized by a power sprayer.

Ants have been incriminated experimentally in the spread of typhoid and cholera and food must be protected from their depredations. They may be kept from food on tables by tying kerosene soaked rags around the legs of the tables. If the place of entry into the barracks or mess hall can be traced, a small sponge soaked in sweetened water, placed near the entrance, will attract the ants and when the pores of the sponge are filled with them, it may be dropped in boiling water and the process repeated. Nests may be destroyed by digging up earth over and around them for several inches, pouring in about a pint of gasoline or kerosene and setting it afire.

Lice have been a problem to the military for hundreds of years. They carry typhus fever (epidemic type), trench fever and relapsing fever. There are three varieties of lice, the head louse, body louse, and pubic louse. Body and pubic lice are also known as "cooties" and "crabs" respectively. The best protection against lice is cleanliness of person, clothing and bedding. Individuals who bathe daily and who do not sleep in their clothes have little to fear from louse infestation.

There are three general methods of disinfection: heat, chemicals and storage. Heat is the most practicable and generally most efficient disinfecting agent. Articles made of felt, leather or webbing are seriously damaged by heat and are best disinfested by chemical means; such as by sponging them with a 5% Cresol solution.

Large organizations may be disinfested in a permanent establishment such as a delousing plant. A delousing plant is established by the Quartermaster where there are large concentrations of troops. The clothes are disinfested in large steam sterilizers while the soldiers are examined, shaved, scrubbed and thoroughly cleaned up before they are permitted to put on clean clothes.

There is also an Army unit called the Quartermaster Sterilization and Bath Battalion which is designed for unit disinfection of men, their clothing and equipment in the field. This organization will operate wherever there is a need for its services. It may operate a fixed delousing plant; or it may utilize its mobile equipment to set up a temporary establishment.

There are simple improvised devices which may be set up by individual companies or smaller units in the field if no facilities are provided by higher authority for disinfecting the men. These devices are the so-called Serbian barrels which, while they may differ in design, are the same in principle. The Serbian barrel consists of a container for the material to be disinfested, below, or in the lower part of which, there is a receptacle for water. This sits on an improvised furnace or firebox. The galvanized iron garbage can is the most practicable and no separate containers for

water are necessary (Plate 4). Water to a depth of about 4 inches is placed in the bottom of the can which is placed over the fire. A wooden grate supported on sticks about one foot in length is placed at the bottom of the can to separate the clothes from the water. Hooks on which to hang the clothes may be improvised from nails driven into the lid. Clothing is left in the can for 45 minutes after steam commences to escape. The clothing or blankets should be hung loosely. Two barrels working full time will be able to disinfest the clothing of approximately 200 men. It is best however, to have 3 or 4 barrels operating to do real effective work. While the clothes and effects of the soldiers are being disinfested they themselves must be scrubbed and cleaned. A kerosene soap should be used.

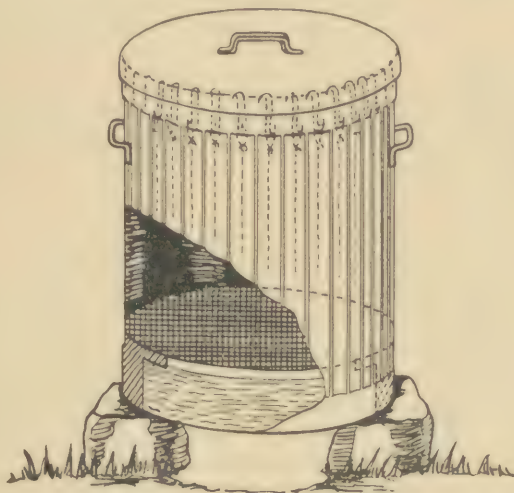


Plate 4. The Serbian Barrel for Disinfestation of Clothing.

If pubic lice are detected in the command, daily inspections should be carried on while control measures are in progress. The most effective control is to shave the pubic region; wash the parts with strong soap and follow this with an application of kerosene or alcohol and ether. Daily examinations are necessary to be sure that case is cured.

Ticks may be divided into two families: hard ticks and soft ticks. The hard ticks are responsible for Rocky Mountain Spotted fever, a typhus like disease transmitted in the west by the *Dermacentor andersoni*, a wood tick, and in the east by the *Dermacentor variabilis*, a dog tick; also Mediterranean eruptive fever spread by another type of dog tick. These hard ticks may cause a form of acute ascending paralysis which, especially in children, may end fatally. It appears to be an intoxication due to the injection of tick saliva during a period of several days' attachment. Recovery is usually rapid if the tick is removed before the muscles of respiration are involved. Louping ill, an encephalomyelitis of sheep, common in certain parts of Scotland, is due to a virus said to be transmitted by a hard tick. Human infections may occur.

One does not usually feel when a tick is biting. If a tick is removed forcibly the mouth parts will be left in the skin and may have to be removed surgically. A tick can be made to loosen its hold by touching it with a moistened cigarette, or by applying turpentine, kerosene or gasolene to it. A fairly effective vaccine for the prevention of Rocky Mountain spotted fever is available and it protects for one year.

The soft tick is responsible for several forms of relapsing fever. The tick borne relapsing fevers are found chiefly in two large areas. The first is chiefly limited to districts bordering on the Mediterranean, and the second embraces the greater part of the Western Hemisphere including many of our southern states, Central America

and the northern part of South America. In the American form small rodents are the animal reservoirs of infection.

Fleas are agents for the transmission of plague and typhus fever (endemic). They are eliminated by eradication of the animal host which infects them. Fleas will resort to man when the normal host is not available, and, if his former host was infected, the disease will be transmitted to the human host. As man may be closely associated with domestic animals he is apt to be bitten by fleas normally parasitic on such animals. If the fleas are traced to rats, then effective rat control measures must be employed. Pet animals may be freed by the use of various methods such as powdering with derris root powder, pyrethrum powder, or bathing in a solution of 2 per cent cresol, or kerosene and soapy water. If a building or room is infested with fleas, fumigation with hydrocyanic acid gas or sulphur dioxide is effective. The room should then be swept and the sweepings burned.

Rodent Control. Rodent control is important because rodents, especially rats are hosts for fleas which are capable of transmitting plague and typhus fever. In order to control the disease the original reservoir of infection, the rodent host on which the flea feeds, must be destroyed. Ground squirrels, rabbits, and rats are the most commonly infected rodents. The rodents and the more common diseases with which they may be infected respectively are:

Rats: Bubonic plague, rat-bite fever, typhus fever (endemic).

Ground squirrels, rabbits, woodchucks, muskrats, skunks: *Turaremia*.

Ground squirrels, chipmunks, meadow mice: Rocky Mountain spotted fever.

Rat control is most important because rats serve as hosts for the rat flea and are a source of plague and typhus fever (endemic). Plague has a very high mortality, and may be wide-spread among a colony of rats. Because rats tend to inhabit the same buildings as man, the diseases affecting the rat are apt to be transmitted to man. Measures of control are designed to prevent the migration of rats to a community. If they are already present measures are taken to destroy them or force them to leave. All buildings should be rat-proofed; all openings to buildings which permit entrance of rats should be closed; all drains leading from the building should be constructed to prevent the entrance of rats; building material used should be non-destructible by rats. The storage of food and food wastes should be such as to prevent access to them by rats. Food must be stored in metal containers and so placed as to be away from the walls and off the floor; garbage cans should be covered and the garbage should be disposed of promptly so as not to be accessible to rodents. Cement walls and floors and the storing of food products in refrigerators and metal containers has decreased the incidence of rat prevalence.

Fumigation with hydrocyanic acid gas is the most effective means of exterminating rats and in addition destroys the fleas which are using the rats as hosts. Trapping rats has a disadvantage in that the fleas leave a dead rat, migrating to a living host as soon as one is available.

In a suspected plague area control measures should be carefully planned, using the most suitable methods available. The routine autopsy examination of all rats killed should be continued until an infected rat is found. Measures may include the following: reducing the rat food supply to the minimum, rat proofing, rat poisoning (with rigid supervision), fumigation with hydrocyanic acid gas, and trapping as necessary to secure specimens for examination.

Other rodents are eradicated by destruction of their habitat and by hunting, trapping, or poisoning. When such rodents are used as meat for human consumption (rabbits and squirrels, principally), the meat should be thoroughly cooked. Rubber gloves should be used by persons engaged in dressing these animals or when performing necropsies on infected laboratory animals. Diseases harbored by these rodents are more prevalent in the spring and early summer during the appearance of early ticks.

Measures to Maintain Health and Vitality. Measures designed to maintain the health and vitality of the individual include several factors, some of which are personal and

some are environmental. Watchfulness of the general health and strength is the best insurance against sickness. Proper food, proper clothing, activity (work and exercise), and rest and sleep are all important. Personal hygiene is of paramount importance; it is discussed in Chapter V.

Food. Good food, nutritionally adequate, properly prepared and served, is vitally necessary to good health and discipline. Nothing contributes more to the contentment and morale of the soldier than a good mess. Few things contribute more to good health, buoyant vitality, and natural resistance to disease than adequate nutrition.

Clothing. Proper and adequate clothing protects the soldier from undue exposure to adverse climatic conditions, maintaining his general resistance to many diseases, especially the respiratory diseases.

Activity. Work and exercise must be tempered to suit the physical condition of the men and their environment. Activity improves the general health, especially outdoor work and exercise. Even during severe epidemics it is much better to keep the well men busy in the open air. Working or exercising men until they become slightly tired does no harm, but fatigue is to be scrupulously avoided, especially during an epidemic or a threatened epidemic.

Rest. Rest, relaxation and sleep are next in importance to food in maintaining health. Work periods should be interspersed with short rest periods. In training troops, the type of work should be changed often enough to prevent monotony and provide relaxation. Sleep is a natural process in the maintenance of health, and loss of sleep lowers the vitality. The average person requires 7 to 8 hours of sleep in 24 hours, which should be taken at regular times; however, if needed, sleep at any time is beneficial. Sleep should always be had under the most favorable conditions; in a quiet place, with plenty of fresh, cool air, without drafts; in a comfortable bed with sufficient coverings. Night clothes should be worn whenever possible.

Health warnings. Even though the sick men are not seen by him in person, the organization commander can do much in the prevention and control of communicable disease. The company commander receives definite information every day as to the state of health of his command when he signs the Daily Sick Report. A sick rate of 1 to 2 per cent of the total strength of his command—varying according to the environment and the seasoning of his troops—may be regarded as normal. A sick rate of 3 to 4 per cent should be viewed with alarm and should call for prompt investigation of the general sanitary conditions. A sick rate of 4 to 5 per cent calls for drastic measures, with the closest supervision of environmental conditions. A rate exceeding 5 per cent generally indicates an epidemic of one or more communicable diseases. An unusual number of injuries should cause the company commander as much concern as an excessive number of sick men. The rates mentioned are not the daily admissions to the hospital but are the total number of men absent from duty each day on account of sickness or injury.

Specific Prophylaxis. Specific prophylaxis is limited to a very few diseases. At the present time the most important ones, from the military standpoint, are typhoid fever, paratyphoid fevers, tetanus, yellow fever and smallpox. In the military service protection of the individual against these diseases is a routine matter, required by higher authority. But the commander of a small unit, such as the company, has a very definite responsibility to contribute to this protective procedure by seeing to it that all of his men receive the necessary prophylactic treatment promptly in compliance with these orders. When circumstances require it, such as the prevalence of other communicable diseases for which passive immunity can be obtained by artificial means, the medical officer should make clear to unit commanders the need for specific prophylaxis. The unit commander will rely on his medical officer for information of the presence of such diseases in the command or in adjacent communities. In peace time stations or during campaigns in countries where typhus or cholera is prevalent, all troops are required to be vaccinated against the prevailing disease.

Isolation and Quarantine. Isolation and quarantine are physical measures taken to separate and segregate contacts and infected individuals from those who are well.

Isolation. By isolation is meant the detection and segregation of a person or persons

suffering from a communicable disease, or carriers of the infecting micro-organism, so as to prevent the direct or indirect conveyance of the infectious agent to unexposed, susceptible persons. Isolation is usually maintained in a separate ward of the hospital or in a building separate from other dwellings. The care of the isolated patient should be entrusted only to personnel that is well-trained and experienced in handling such cases and who will also enforce and practice strict personal hygiene.

Quarantine. By quarantine is meant the limitation of the personal association and physical surroundings of persons (or animals) who have been exposed to communicable disease for a period of time equal to the longest usual incubation period of the disease to which they have been exposed.

Working quarantine is the segregation of a group of contacts to prevent the spread of the infection to the unexposed members of the command. This group then continues its training or duties as a separate unit until the period of quarantine is over. In this manner the occurrence of disease may be restricted to the members of the quarantined group. The quarantined group should be inspected by a medical officer once or twice daily in order to detect any new cases of disease in the early stages. Carriers are removed for individual isolation and treatment in a hospital.

Camp quarantine may be established in camps or mobilization centers where there is a prevalent communicable disease. By this measure the entire camp is placed under restriction, and the units therein are limited to the territory of the camp during the period of quarantine.

A *detention camp* may be established within a mobilization center for the housing of recruits so that disease symptoms may appear, if present, without exposing the entire personnel. If a case develops the period of quarantine is then prolonged until a continuous period passes, equivalent to the incubation period of the disease detected, without the development of any communicable disease within the group.

Early Recognition of Disease. The early recognition of the fact that a man is sick is a very important factor in disease control. No special knowledge of medicine is required to recognize that a man is sick with some acute disease. Company officers are not expected to make diagnoses, but they are expected to recognize that a man is probably sick. The specific diagnosis is for the medical officer to determine. In a great many instances even the most experienced medical officers cannot make a definite diagnosis the first time they see a sick man, especially one in the initial stage of a communicable disease, because many such diseases, initially, present several of the same symptoms. The detection of sickness is not as difficult as commonly believed. Company and platoon commanders make frequent inspections of their men, with special reference to their clothing and equipment. Dirty clothes, an unshaven face, or a dirty rifle will seldom be overlooked. It is an equally simple matter to look at men with attention directed to their physical condition. In a short time the alert officer will do so unconsciously and, as in other inspections, the man who is normal in appearance leaves no lasting impression, but the sick man stands out prominently. Sick men should be immediately removed from intimate contact with well men. Segregation of the sick and early, proper disposition of the sick or disabled men of an organization will save three-fourths of the time they would otherwise spend in hospital. Likewise, early recognition of the sick may prevent many unnecessary contacts and prevent the spread of a communicable disease if the ill person detected has such a disease.

PREVENTION AND CONTROL OF VENEREAL DISEASES

Historical Background. For hundreds of years armies have been decimated, and the civil communities in their theatres of operations have been scourged, by outbreaks of venereal diseases, often of epidemic proportions. Biblical history indicates that Moses recognized and took steps to eliminate the venereal disease hazard. The history of the venereal diseases in the United States Army is graphically represented in Plate 5. With very few exceptions, they have been the outstanding cause of noneffectiveness (loss of time from duty) among our troops. During the World War, although the venereal disease situation was unusually good as compared with that of other wars, the loss of time from duty on

account of venereal diseases was exceeded only by that due to an unprecedented outbreak of influenza. During peace time, the venereal diseases ordinarily cause more loss of time from duty than all the other communicable diseases combined, although men with active venereal disease are not accepted for military service. In war time, men with curable venereal disease are accepted, as any other policy would cause the rejection of many serviceable recruits and would also place a premium on the acquisition of venereal disease as a means of avoiding military service.

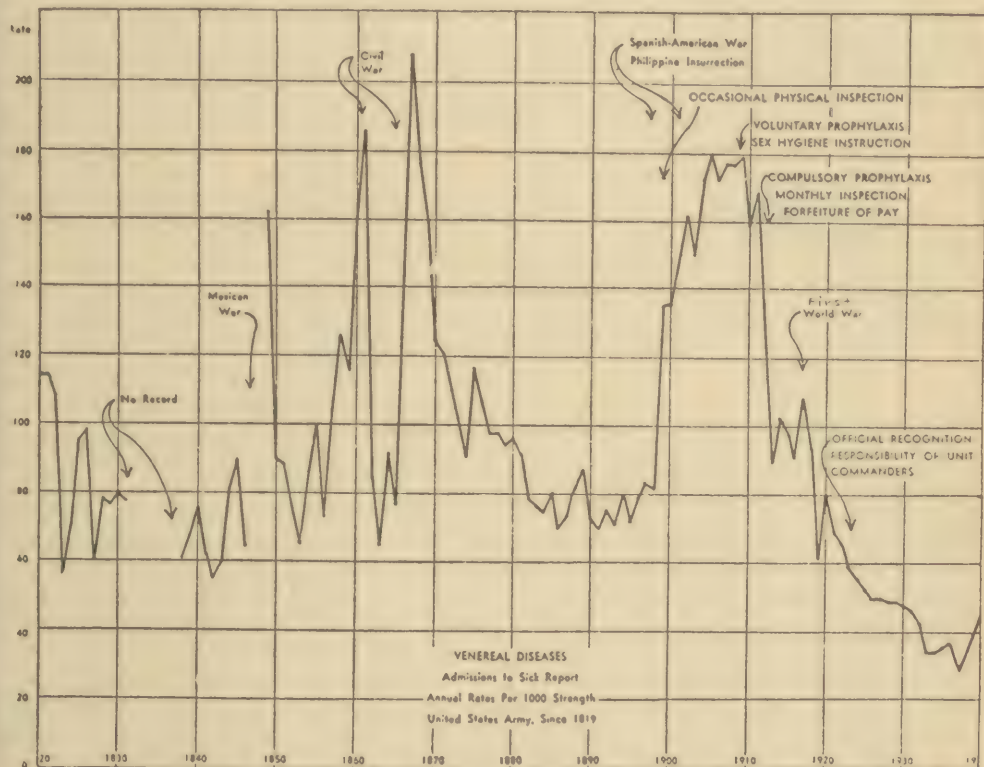


Plate 5. Graph of Venereal Disease Admissions. U. S. Army, 1819-1940.

The Venereal Disease Problem. Control of venereal diseases has been, and still is, one of the most difficult sanitary problems confronting the Army and one of the most serious problems affecting the efficiency of troops. These diseases are prevalent in civil communities, and are brought to military communities by persons in the military service as a result of sexual intercourse. Exposure to infection, and the consequent acquisition of a venereal disease is, therefore, an act on the part of the individual. Few men die from the immediate effects of venereal disease, but many are rendered inefficient and non-effective for long periods. These diseases may easily render a large part of any command entirely unfit for field service. For the daily average during the year 1918 there were 10,788 men and officers absent from duty on account of venereal disease. Our military authorities have long recognized the gravity of the venereal disease situation. In 1910, the Surgeon General of the Army stated: "The venereal peril has come to outweigh in importance any other sanitary question which now confronts the Army, and neither our national optimism nor the Anglo-Saxon disposition to ignore a subject which is offensive to public prudery can longer excuse a frank and honest confrontation of the problem." Now, more than 32 years after that statement was made, civilian authorities, too, are aroused to the gravity of the venereal situation and are taking steps to combat it.

Responsibility for Venereal Disease Control. Until 1923, the responsibility for the

control of venereal diseases was vested almost entirely in the Medical Department of the Army. In that year an Army Regulation was published which for the first time placed the question of instruction and prevention where it belonged—on unit commanders. There is no doubt that a great deal of the credit for the radical reduction in venereal diseases effected, following the publication of those orders in 1923, belongs to the activity of unit commanders in their endeavors to provide healthful sports and decent diversion for their men when off duty. At the present time commanding officers of all grades, from the highest to the lowest, are keenly aware of their responsibilities in this matter. The result of this awareness is graphically shown in Plate 5. While the activities of the company commander in the control of venereal disease in his company are largely of an administrative and disciplinary nature, the company commander is one of the most important factors in the control of those diseases. His attitude toward such control will be reflected by the actions of his men. All company officers should, therefore, be well versed in the nature of the venereal diseases and the means by which they can be controlled.

The Venereal Diseases. The four venereal diseases are: gonorrhea, chancroid, syphilis, and lymphogranuloma inguinale. All are infectious diseases. These diseases are more prevalent among colored persons than among whites.

Gonorrhea is almost invariably transmitted among adults by sexual intercourse. About three days after exposure the victim first notices a burning on urination, followed in 24 to 48 hours by a yellowish discharge from the penis, which may continue for several weeks. In the untreated case, the discharge may continue for several months. At any stage of the case in which gonorrheal germs may be found, the disease can be transmitted during sexual intercourse. Gonorrhea is both a local and a general disease. Its most obvious effects are on the mucous membrane of the urethra. The germs may be carried by the blood stream to the joints where they produce gonorrheal arthritis, a very disabling type of rheumatism, or they may be carried to the heart where they produce gonorrheal heart disease. The germs often get into the testicle, causing a long and painful disability which may result in sterility. The most distressing complication in gonorrhea of the eyes. In this affliction, the germs have almost always been carried to the eyes by fingers soiled with secretions from gonorrhea infected genitals. Most cases of gonorrhea of the eyes result in blindness.

Chancroid, also known as "soft chancre," is transmitted by sexual intercourse. About three days after exposure one or more small sores appear on the penis. These sores grow larger quite rapidly and within two or three days the whole head of the penis may be involved. The lymphatic glands in the groin are usually affected; these swollen, infected glands are "buboes" (commonly called "blue-balls") and almost invariably break down, leaving large, open sores. Chancroid sores and chancroid buboes heal very slowly, the victim being disabled for several weeks or even for months. In about half the cases of chancroid, a syphilitic infection is also present.

Syphilis is most frequently acquired through sexual intercourse. The initial sore, called a "chancre," or "hard chancre," normally appears on the genital organs, usually about the head of the penis. Infection may take place by non-venereal direct contact, such as by kissing a person who has active syphilitic sores in the mouth. The initial sore (chancre) is found at the point of infection, generally about three weeks after exposure. By the time the chancre is of noticeable size the syphilitic infection has been carried by the blood stream to every part of the body. A few weeks later, in the untreated case, syphilitic sores appear in the mouth, a syphilitic rash usually appears on the skin and buboes may appear in the groins. In a few years the heart and blood vessels will have been seriously damaged, and the brain and nervous system will have been invaded and changed by the syphilitic infection. Untreated cases of syphilis never recover from the disease. Such cases not only never recover, but they also transmit the disease to their children, this being one of the very few diseases transmitted from parent to offspring before the birth of the latter. "The sins of the father are visited on the sons, even to the third generation."

Lymphogranuloma inguinale. Lymphogranuloma inguinale is a specific infectious disease transmitted by venereal contact. It may, however, be transmitted in other ways,

as the secretions and discharges from the lesions are infective. It is the so called "fourth venereal disease," and since June, 1937 has been reported by the Medical Department as a venereal disease following instructions issued by the War Department to that effect.

The incubation period is from one to seven weeks, the average being about three weeks. The initial lesion is usually on the glans penis or prepuce in the male, it being a papular infiltration which may be accompanied by prostration, headache, and pyrexia. In several weeks, the inguinal glands (most commonly unilateral) become enlarged, painful, and coalesce into a mass with distension of the overlying skin which becomes a dark purplish red. Soon isolated softened areas appear, which rupture, and a sero-purulent fluid (infective) exudes from the multiple sinuses. The intensity of the disease may vary. However, all cases of adenitis become chronic, causing much scarring which may be extensive. The mortality is low, but the morbidity is high and the period of convalescence may be weeks, months, or years in duration.

Diagnosis is confirmed by the use of the *Frei* intra-cutaneous test, which is the injection of the specific antigen intracutaneously in the forearm. In 24 to 48 hours a positive test will reveal an area of erythema one to several inches about a papule approximately 8 to 10 millimeters in diameter. A negative reaction has a small area of erythema (with a papule less than 7 millimeters in diameter, usually 3 to 5 millimeters). A control injection of an equivalent amount of normal saline solution may be used. The test will be positive in the early stage of adenitis.

This disease is prevalent in the tropics, especially among the prostitutes. It is comparatively rare within the United States. Because of its recognition and positive differentiation from the so-called non-venereal bubo it is placed under the same measures of control as other venereal diseases. An attack of the disease does not confer immunity, and the susceptibility is universal. There is no specific cure, the best recommended procedure being the surgical removal of the involved glands before suppuration. When secondary infections occur they are treated locally, with similar general measures as for other infectious diseases.

Treatment of the Venereal Diseases. The venereal diseases can be cured if the victim will present himself promptly to a reliable doctor for treatment. Self treatment, or something obtained from and upon the advice of the clerk in the drug store, will likely be entirely ineffective. Quack doctors are not so much interested in effecting a cure in such cases as in prolonging the treatment for their own financial benefit.

Communicability. The venereal diseases are communicable; every case comes from some other case. They are transmitted by direct contact. To prevent their spread the chain—source of infection, susceptible material, and contact between them—must be broken. A previous attack does not confer immunity, and there is as yet no specific immunizing agent such as we have in typhoid fever or smallpox.

Sources of Venereal Disease. The primary, or direct, source of venereal disease is usually the infected woman who practices illicit sexual intercourse. In the majority, such women are prostitutes. It is extremely rare that these diseases are innocently transmitted from soldier to soldier. The secondary, or indirect, source of venereal disease is the infected male population, civil and military.

General Prevalence of Venereal Disease. The prevalence of venereal disease in the civil population of the United States cannot be accurately determined. Studies show that more than 75 per cent of all prostitutes are infected; the chances that a prostitute will escape all venereal infection are remote, although she may not be capable of transmitting the infection at all times. Information obtained during the World War showed that 5.6 per cent of the men who presented themselves for military service were the victims of active venereal disease. It is estimated that at least 10 per cent of all civilian males are the victims of active venereal disease at any given time. During the present "National Emergency" 6 per cent of physical rejections were due to venereal disease.

Obstacles to the Control of Venereal Disease in the Army. The spread of venereal disease among troops is influenced by a number of factors that do not obtain in other

communicable diseases. The primary source of infection, that is, the infected woman, and the major portion of the secondary source of infection, the infected male, are beyond direct control by military agencies. It is therefore evident that the fullest co-operation of the civil authorities must be obtained in order to make any material reduction in the basic sources of these diseases.

General Control. Fundamentally, measures for the control of venereal diseases are designed either to prevent exposure to venereal infection or to prevent the development of the infection in the exposed individual. Prevention of exposure consists of control of prostitution, educational measures, recreational measures, and deterrent laws and regulations, and the abatement of active cases among military personnel. Prevention of development of infection in the exposed individual consists of chemical prophylactic treatment, the effectiveness of which is dependent on the training and discipline of the command.

In order to strengthen and augment the program of venereal disease control to meet new conditions created by the present war, an officer of the Medical Corps, specially trained in this field and designated as the "Venereal Disease Control Officer" is assigned as assistant to the surgeon of the following commands: Each division; each army, headquarters communication zone; General Headquarters; each service command; each department; each station complement serving 20,000 or more troops. This officer establishes and directs, through the surgeon, a comprehensive and unified program for reducing the non-effectiveness resulting from venereal disease (letter, WD AGO February 6, 1942. He prepares and forwards through military channels as an appendix to the monthly sanitary report a statement of all pertinent information concerning his activities for the period.

Control of Prostitution. Control of prostitution is accomplished by two generally recognized methods—regulation and suppression. Regulation does not actually regulate but serves to promote rather than to limit the spread of venereal disease. Regulation is no longer countenanced anywhere in the United States as a legitimate means of controlling prostitution. Control by suppression does not eliminate the prostitute, as prostitutes are always present in any civilian community of any considerable size. It does, however, greatly reduce exposure to venereal disease by the elimination of open houses of prostitution, and it restricts the activities of the prostitute by rendering the practice of prostitution more difficult and the prostitute less accessible. Suppression of prostitution is a police function of the civil authorities. The laws which make prostitution illegal also facilitate the enforcement of measures for the direct control of venereal disease by civilian health authorities. In controlling sources of venereal disease in civilian communities adjacent to military communities, the military authorities can influence and promote that control through cooperation with civilian authorities in ways which vary with and depend upon the local economic and political situations. Such influence is usually exerted by the higher military commanders, but company officers frequently have opportunities to lend their support to such movements. During the World War the welfare organizations and the public health bodies throughout the country united in their efforts with those of the Medical Department of the Army to help prevent these diseases among the men in the army while serving in this country and in France. Saloons were closed to soldiers, and no vice resorts were allowed in the vicinity of military camps. In July, 1941, Congress passed the May Act which enables the Federal government wherever necessary to take over from the local authorities the policing of areas near military stations.

Military Control by Prevention of Exposure. Education. Educational measures are for the primary purpose of reducing the number of exposures to venereal infection by providing the individual with accurate information regarding the spread of venereal diseases, their effects on the human body, and the methods of prophylaxis. Most of this instruction should be given by medical officers and by company commanders of the troops concerned. (See AR 40-235.) Standing orders require that every soldier, upon enlistment or reenlistment, be given instruction every 6 months in "sex morality" or "sex hygiene." This instruction is usually divided into three parts: the moral

aspects, the medical aspects, and the administrative aspects. These different subjects are usually presented to the men by a chaplain, a medical officer, and a company commander, respectively. This instruction should be comparatively brief, sincere, and in simple terms. The efficient and alert company commander will not be satisfied with perfunctory instruction of his men but will seize opportunities to simply, clearly, and briefly drive home the essential points. Troops are best instructed by their immediate officers; a soldier will take an interest in the instructions of his company officers but will resent "preaching" from other sources. The instruction which troops receive should include: (1) Information concerning the local environment; the prevalence and danger of venereal disease in the adjacent civil community. (2) The danger from venereal disease to themselves and their associates, and to their wives and children. (3) The standing orders requiring prophylaxis after exposure. (4) The use and abuse of prophylaxis. (5) Punishment they may expect for failing to report the contraction of a venereal disease. (6) The fact that continence does not weaken them physically or sexually. (7) Their duty to the government and to themselves.

Recreation. Recreational facilities for soldiers are extremely important. Well equipped day rooms, reading rooms, service clubs, and gymnasiums; athletic contests, motion picture shows, band concerts, dances, or any other activities which provide wholesome interest for troops and serve to keep the soldier in the military community, reduce the number and length of periods during which he must find or provide his own entertainment, thereby reducing the opportunities for and number of exposures to venereal infection.

Abatement of sources of venereal disease. In military communities, since part of the indirect source of infection is the soldier with venereal disease, every effort is made to decrease the sources of infection by the prompt detection of cases of those diseases among the personnel, placing them in quarantine and effecting their cure. To this end, standing orders require that troops will be inspected at least once each month for physical defects of all kinds, including venereal disease. These inspections are made by a medical officer, who should always be accompanied by a company officer of the unit concerned.

Chemical prophylaxis. Realizing that in spite of all the efforts to prevent it some men will expose themselves to venereal infection, the army furnishes "prophylactic treatment" for the prevention of the development of the venereal diseases. This prophylaxis is accomplished by the use of chemicals that destroy the various germs that cause the venereal diseases and do not harm the person treated. The treatment must be used after *each exposure* to these infections. It should be noted that this type of prophylaxis is quite different from the immunizing treatments mentioned in connection with certain other communicable diseases. The venereal prophylactic treatment properly administered within an hour after actual exposure is 90 per cent (or more) effective in preventing the development of venereal diseases. If the treatment is delayed for 5 or 6 hours after exposure the protection is only about 50 per cent effective. The prophylactic facilities are furnished and operated by the Medical Department.

The soldier must not be permitted to administer the treatment by himself. The attendant should insist on complete accuracy of each step in the treatment. The steps are as follows:

1. The genitals are examined for signs of venereal disease. If there is any suspicion, the attendant should not give prophylaxis until a medical officer has seen the soldier. The medical officer should respond promptly to such a call.
2. The soldier is then made to urinate.
3. The penis, scrotum and adjacent parts of the body are then washed thoroughly with liquid soap and warm water. The foreskin must be retracted and every part thoroughly washed.
4. The soap is flushed off with a 1-1000 Bichloride of Mercury solution and every part of the penis and scrotum and surrounding skin is washed off with the bichloride. The penis is allowed to dry by evaporation.
5. One dram of a fresh 2% Protargol solution is then injected into the urethra.

This is done slowly. The solution is retained in the urethra for five minutes *by the clock*. The meatus should be held tight enough to retain the fluid while allowing an occasional drop of protargol to escape.

6. After the time limit of 5 minutes has expired, the pressure on the meatus is released and the protargol solution is allowed to escape without pressure on the urethra to expel the last drop, which it is desired should remain.

7. About $\frac{1}{2}$ dram of calomel ointment is then picked up with a tongue depressor and the attendant smears it over the surface of the penis while the soldier retracts his foreskin. The calomel is thoroughly rubbed into the penis, particularly about the meatus, head, shaft, around the scrotum and surrounding body area. The rubbing is continued until the ointment has disappeared, leaving only a greasy film. The foreskin is then drawn over the head of the penis to protect the ointment from being rubbed off.

8. The attendant then provides toilet paper or a paper towel to be wrapped around the genitals so as to protect the clothing.

9. The soldier is then directed not to urinate for a period of 4-5 hours after the treatment.

Local Commanders will inform all men going on pass of the availability of the prophylactic supplies but enlisted men will not be required to have them in their possession if they do not desire to accept them. (*War Department Circular No. 53, February 23, 1942.*)

There are several individual *prophylactics* manufactured commercially. Some one of these will be stocked by post exchanges. They are not as efficient as the treatment given in prophylactic stations but are of great value for soldiers who are unable to get to a station within an hour after exposure. Even after using one of these tubes or condoms a soldier should report to a prophylactic station.

Cleanliness. If a soldier has exposed himself and has used no condom nor had access to a station, he should empty his bladder, and then scrub his genitals and the surrounding skin areas with soap and water. This may serve to prevent infection.

Punitive measures. (1) Any individual who knows or believes that he has contracted a venereal disease must report that fact to his immediate commanding officer without delay. Trial by court martial or other disciplinary action is discretionary with the commanding officer. No disciplinary action is authorized for failure to take prophylaxis or for having contracted a venereal disease.

(2) Any person in the military service who loses time from duty because of a venereal disease forfeits his pay during the time so lost and must make good the time lost.

Physical inspections. The periodical physical inspections which are conducted at least once each month for all enlisted men below the first three grades include inspection for evidence of venereal disease. Additional inspections may be arranged if it is believed that some men may be concealing venereal disease. These are most effective if conducted early in the morning or just after return from outdoor activity.

Treatment. All cases of venereal disease should be promptly sent to the hospital or dispensary for treatment. Early treatment offers far better chances of cure than does delayed treatment. Self-treatment or treatment by unskilled individuals are both ineffective and dangerous.

Action to reduce high venereal rate. In case a command has an excessively high venereal rate at any time, stringent control measures may be necessary. These may include all or part of the following:

Placing houses of prostitution and all places selling liquor, out of bounds.

Patrolling of restricted districts by military police.

Limiting all passes to 4 hours and granting no passes after 9 p. m.

Classifying passes.

Routine bed check.

Army Regulations on Control of Venereal Diseases. Army Regulations 40-235, paragraphs 1 to 7 inclusive, are herewith included to furnish information about the preventive measures against the venereal diseases and the manner of putting them into

effect. They will also assist the reader in maintaining and completing the required records and returns pertaining to venereal diseases.

1. **Education in Sex Hygiene.** *a. Responsibility of commanding officer.* Commanding officers of all grades are responsible for promoting education in sex hygiene among military personnel.

b. Instruction of officers. In all troop schools conducted under the provisions of AR 350-2600, and at the Air Corps Training Center for student officers and flying cadets, a course of instruction of sex hygiene will be given, commencing with the school year 1939-40. In such courses there will be stressed the duties and responsibilities of unit commanders in the prevention and control of venereal disease among the members of the unit, and the best methods of accomplishing this prevention and control.

c. Instruction of enlisted men. At least twice each calendar year and at intervals of approximately 6 months, the commanding officer of each basic unit and detachment will arrange and personally supervise suitable instruction in sex hygiene and the prevention and control of venereal disease for all enlisted men of his command. These instructional periods will be conducted informally; questions and discussions by the enlisted men will be encouraged. A medical officer designated by the post commander will discuss the nature and gravity of venereal diseases, their effect on mental and physical fitness, the importance of early discovery and treatment, and the means of avoiding them. The unit or detachment commander will present the broader social aspects of the problem and will call attention to the harmful influence of such diseases on military efficiency through the absence of men undergoing treatment. A chaplain will discuss the moral aspects.

d. Instruction of recruits. The instruction prescribed in *c* above will be given to all recruits as soon as practicable after enlistment.

2. **Physical Inspections.** In the physical examinations of military commands prescribed in AR 615-250, special attention will be directed to the detection of venereal diseases.

3. Prophylaxis. *a. Prophylaxis stations.*

(1) Establishment. Commanding officers will require that a sufficient number of prophylactic stations be established at suitable locations in each military command. When facilities permit, and necessity therefor exists, such stations will also be established in adjacent civilian communities. Prophylactic stations will be conducted under the supervision of the surgeon, and will be administered by selected and reliable enlisted men who have received thorough training in their duties.

b. Prophylactic materials for individual use. Post exchanges will have available for sale at as low a price as practicable suitable materials for individual prophylaxis for venereal disease. The composition and quality of these materials will be prescribed by the commanding officer upon the recommendation of the surgeon.

c. Responsibility of individual. Any individual who exposes himself to venereal infection will employ individual prophylactic materials as a measure of protection against infection and in addition, whenever practicable to do so, will report at once to the nearest military prophylactic station for such cleansing and prophylaxis as may be prescribed by the War Department.

4. **Forfeiture of Pay.** Forfeiture of pay by persons in the military service of the United States who are absent from duty on account of the direct effects of a venereal disease due to misconduct is provided for in act May 17, 1926 (44 Stat. 557); 10 U. S. C. 847b; M. L., 1929, section 1442. For details regarding the administration of the act, see AR 35-1440, 40-1030, and 345-415.

5. **Disciplinary Action.** Persons in the military service will not be subjected to trial by court-martial or other disciplinary action upon charges of having failed to take prophylactic treatment after illicit sexual intercourse, or having contracted venereal disease, or of having thus incapacitated themselves for duty. Any individual who knows that he has contracted, or has reason to believe that he may have contracted a venereal disease, will report the fact to his immediate commanding officer without unnecessary delay in order that proper medical treatment may be given. Trial by court-martial or other disciplinary action for failure so to report is discretionary with the commanding officer.

6. Reports and Records Required. *a. Special reports.*

(2) The surgeon will render to the commanding officer of the station a monthly venereal disease report comparison of the current prevalence of venereal disease with that prevailing during the previous monthly periods in the corps area, or expeditionary force, and in the Army as a whole, together with pertinent information relating to control measures of proved value.

7. **Segregation and Treatment.** Every case of venereal disease will be promptly subjected to treatment, but not necessarily excused from duty unless, in the opinion of the surgeon, it is considered desirable. A list of those treated but not excused from duty will be kept both by the organization commander concerned and by the surgeon, and such individuals will be required to report to a medical officer for systematic treatment until cured or discharged from the service. Individuals in the infectious stages of venereal diseases will be hospitalized, held in working quarantine, or restricted to the limits of the station, as may be recommended by the surgeon.

CHAPTER V

MILITARY HYGIENE

Definition. Military hygiene is the science of preserving and promoting the health of military personnel. It is the system of securing and maintaining proper personal hygiene by individual members of a military organization.

Personal Hygiene. Personal hygiene refers to those measures or precautions which every person should observe for the purpose of maintaining his own health and physical well-being. It requires the application of a few common-sense rules, the observance of wholesome habits, and the avoidance of excesses of all kinds. It is a phase of the larger subject of Hygiene which deals with the principles and laws of health. These principles and laws are basic and made by Nature. Accordingly, they never change. Community cleanliness is merely the result obtained within a compact group in which all members obey the principles of personal hygiene. An important by-product is the prevention of the spread of communicable disease. Therefore, the application by each individual of health-saving, personal hygiene measures is the cornerstone of the maintenance of group health and of the field of preventive medicine. Personal hygiene is the basis of military hygiene.

Responsibility for Applying Hygienic Measures. Personal hygiene is an essential part of the daily life of the soldier. He is a part of a large and compact unit of men. The health of the man who sleeps or walks beside him may be affected by his neglect or carelessness. The function of the Army in war is to win battles, and they may be won only by strong, healthy, vigorous men. Constant observance of the laws of good health becomes an important responsibility for all Army units and for the individuals who constitute them.

It is Army custom that the individual soldier is held rigorously responsible for the hygienic care of his own person, for his personal equipment, and the area which he occupies. As he must live in a clean, wholesome environment, because decency, self-respect, and efficiency cannot exist in the midst of unclean surroundings, such practices must be followed uniformly by all members of the unit. The leaders of military units, from the smallest to the largest, are held responsible that this condition is attained. The squad leader is responsible that all members of his squad adhere to the principles, the platoon leader for his platoon, the company commander for his company, and the practice continues throughout all echelons of command. Thus, the Army system is based upon individual observance of the laws of personal hygiene; but, as in all other matters, the leaders of units are required to insure obedience within the group for which they are responsible. This system establishes military hygiene.

Responsibility of the Medical Officer. The medical officer is not responsible for enforcement of this system for that duty falls upon organization commanders. But he has very important duties in connection therewith. Above all others he is expert in his knowledge of hygienic requirements. He is a staff officer and adviser to his commanding officer in all medical and health measures. His status presents a duty and opportunity to exert an important influence over the health measures in use by the officers and men of the organization. By inspection he can determine the hygienic laws which are being violated. By instruction he will be able to improve the knowledge and understanding of the officers and men of the unit of which he is a part. In this way the medical officer may exert a profound influence in the improvement of hygienic conditions affecting the lives and physical welfare of the men of the command whose illnesses will otherwise reach him for treatment and cure.

NUTRITION

Importance. The appetite has been man's chief guide to his dietary requirements and remains one of our most dependable indicators. While it is unsafe to depend on its guidance alone it is, nevertheless, a more reliable guide than speculation or too narrow

scientific dogmatism. We know that when appetite is lost it is a warning of mental or physical disorder. Certain conditions other than disease influence digestion. The earliest indications of mental or physical irregularity may be manifested by the loss of appetite, combined with disorder of the alimentary tract. This is evidenced most sharply in children who seem to be safeguarded by nature from the excessive use of food.

It is well known that emotional states and the condition of the mind affect nutrition. Disturbances of the nervous system such as worry, remorse, jealousy, heavy responsibility and the like, adversely affect nutrition and should be avoided.

Eye strain is another deleterious factor; a capricious and faulty appetite often arises from this cause. Ocular defects and refractive errors should be corrected.

Improper posture and improperly fitting clothes (trouser belt or field equipment belt) affect the blood circulation in the liver and abdominal organs, consequently impairing digestion and nutrition.

Eating immediately before or after bathing or exercise is not a healthful practice. The digestive organs are depressed temporarily as a result of bathing and physical exertion.

Dietary Requirements. The requirements for a healthy adult with regard to the various food components are as follows:

FOOD REQUIREMENTS FOR AN ADULT (IN GRAMS).

	<i>At heavy labor</i>	<i>At rest</i>
Proteins (roughly flesh)	180-210 grms.	75 grms.
Fats	105-135 grms.	30 grms.
Carbohydrates (starches and sugars)	480-540 grms.	360 grms.
Salts	30-45 grms.	15 grms.

In calories the fuel requirements for the body are as shown in the table:

CALORIES REQUIRED BY A MARCHING SOLDIER.

<i>Load</i>	<i>Road</i>	<i>Normal needs</i>	<i>Extra work</i>	<i>Total</i>	<i>10% for waste</i>
0	Level or undulating	2064	900	2964	3260
50 lb.	do.	2064	1172	3236	3560
50 lb.	Ascending 100 feet per mile	2064	2110	4174	4590

Vitamins. Vitamins have been proven to be necessary constituents of the diet, lack of them causing a variety of so-called deficiency diseases.

The purity and synthesis of the most important vitamins have been established. The commonly recognized ones together with the diseases resulting from their deficiency are described below:

Vitamin A deficiency will cause xerophthalmia, night blindness, susceptibility to infection, and lack of proper growth. This vitamin is found chiefly in animal and vegetable fats, green vegetables, and egg yolk.

Vitamin B₁ (thiamin chloride), the antineuritic vitamin, is found in the outer layer of grains. A deficiency causes beriberi.

Vitamin B₂ Complex consists of a large number of separate factors. The chief of these are: Riboflavin, a deficiency of which causes ariboflavinosis; Pyridoxine hydrochloride, lack of which produces muscle disorders; Nicotinic Acid and Pantothenic Acid, the antipellagra group; and several others essential for growth and for the health of skin and mucous membrane. These vitamins are found in large amounts in liver and yeast.

Vitamin C (ascorbic or cevamic acid) is our chief protection against scurvy. It is essential in the maintenance of sound bones and teeth and aids in resisting infection. It is found in abundance in citrus fruits, tomatoes, and milk.

Vitamin D, the antirachitic vitamin, is our protection against rickets and osteomalacia. It is necessary for the proper metabolism of calcium and phosphorus, being found in fish liver oils and irradiated foods. Ultraviolet light or sunlight is beneficial in deficiencies.

Vitamin E (alpha-tocopherol) is valuable in certain reproductive and neuromuscular disorders. In a concentrated form it is present in wheat germ oil.

Vitamin K is necessary for the coagulation of blood, deficiencies being found in certain liver and gall bladder disease.

Diets which include a mixture of the following foods will contain enough vitamins to satisfy the requirements of the body: milk, butter, eggs, spinach, whole grains of any kind, dried beans, tomatoes, raw cabbage, citrus fruits, lettuce, raspberries, liver, fish, and meats. Vitamin C may be destroyed by cooking, others to a slight degree only. Vitamins are not lost by foods during storage.

Adequate Diet. Food should be agreeable to the taste and appetite and should be well and tastily cooked. A proper menu should include an abundance of green vegetables in order to supply the necessary vitamins as well as acids, salts, and extractive matters. They also add bulk to the intestinal contents by virtue of their contained cellulose and therefore serve as important stimulants to intestinal contractions and promote normal bowel action and excretion. Fruits also are an important dietary article for they not only add bulk to the diet but also have an advantage on account of their organic acids. These acids aid in preserving the acid-base equilibrium in the body tissues. That is, they help to preserve the neutrality of the blood and tissues.

Sugar and starches supply the main fuel for the combustion in the body. Sugar is a necessary part of the diet but when taken early in the meal lessens the appetite and embarrasses the digestion.

Fats and oils in moderate amount are a necessary part of any diet and are required even in warm climates. Emulsified fats may be absorbed by the intestinal tract without digestion, hence are easily assimilated.

Salts of sodium, potassium, calcium, magnesium, and ammonium are essential to the human body and must be supplied. The lack of ordinary table salt in the diet is soon felt and the craving for it becomes almost unbearable when it is denied. Animals will travel for miles and risk their lives to visit salt licks, and among savages and inland peoples salt is a highly prized commodity. Salt is necessary in cellular nutrition and in the production of gastric juice.

Water forms the bulk of the human body and requires constant replenishment. Most people drink too little water. Water may be taken with meals but food should not be washed down by draughts of water since this inhibits starch digestion and enables the individual to swallow morsels of food too large for the stomach to manage comfortably.

Condiments add taste to the food but used in excess are harmful. Other stimulants should, for the most part, be avoided. Coffee, tea, and cocoa in moderation are acceptable dietary additions.

Constipation. Constipation arises usually from a diet that is deficient in bulk, from a sedentary mode of life, from improper carriage and body tone, and from neglect to respond to the impulse to evacuate the bowel. The remedy lies in the correction of these defects and the cultivation of regularity in habits.

The deleterious effects of constipation are well known. If chronic constipation exists the advice of a medical officer should be obtained in order to avoid dangerous complications. If definite pain is noted in the abdomen, the use of a cathartic should be avoided until and if administered by the physician. When the services of a medical officer are not available, a plain luke-warm water enema given slowly may be used without much danger to obtain temporary relief.

Rules for Regulation and Control of the Diet, and matters pertaining thereto, are summarized as follows:

Keep the mouth clean and healthy to avoid spread therefrom to the alimentary tract. Visit the dentist periodically to avoid the possibility of any dental defect and to insure complete cleanliness.

Correct any body defects that affect nutrition, such as emotional conditions, eye defects, and errors of posture.

Avoid eating immediately before or after hearty exercise or after bathing.

Satisfy dietary requirements as to proteins, fats, carbohydrates, salts, water, and vitamins. Have the calory (fuel) intake adequate to the needs.

Have enough bulk in the diet and secure a daily bowel movement by hygienic living and regularity in habits.

Be careful of uncooked and unsanitary foods. They may contain disease germs.

Eat food regularly and in moderation, eating it slowly and masticating it thoroughly. Most people eat too much.

Food should be kept from flies and insects that may carry disease. Mess kits and dishes should be washed in boiling water to cleanse them and to kill any disease germs. Cooks and mess attendants should observe scrupulous cleanliness in all these respects in their persons.

Food that seems stale or spoiled should not be eaten.

Do not eat in dirty lunch rooms and restaurants.

An abundance of water should be taken, but too large an amount should not be taken when overheated. An adult should consume at least eight glassfuls daily. There is little danger of taking too much. Remember that water forms fully two-thirds of the body weight or about ten gallons in an average individual.

Be careful not to drink unclean water which might contain disease germs.

Do not drink cold water rapidly when overheated or drink anything excessively hot at any time.

Coffee, tea, and cocoa in moderation are not harmful and in many instances prove very beneficial. Intoxicating liquors are harmful.

Drink from your own glass and eat from clean dishes. Do not exchange pipes, cigars, musical instruments played by the mouth, and gas masks with others.

Do not be careless in the disposal of the excretions of the body. These create a nuisance, serve as a breeding place for flies, and may spread disease.

If there is any question about your physical health or any matter about personal hygiene, consult a medical officer who will assist you and nature in maintaining the health that is your birthright.

DENTAL HYGIENE

Care of the Mouth. Physicians have identified well over 100 forms of micro-organisms in the mouth. The presence of a warm, moist environment, with fragments of food lodged between the teeth to serve as a nutrient material, creates an ideal condition for their development. It is important to the soldier that adequate attention be given to the care of the mouth, including the teeth and the gums.

The teeth are very important in the maintenance of adequate nutrition, and, in turn, adequate nutrition is very important to the teeth. The teeth should be well brushed and the mouth rinsed at least twice each day, especially on retiring for the night. Brushing teeth should be performed with a rotary motion in order to free all foreign material adhering to the gum surfaces and to exercise the gums. If a tooth brush is not available the gums and teeth should be rubbed with the finger, using the same rotary motion suggested for the tooth brush. Dental floss or tape should be used to remove foreign matter lodged between the teeth. The tooth brush should be dried thoroughly between brushings. A frequent change of tooth brush is necessary to insure effective brushing and cleanliness. If a mirror is available, the individual should use the same care in brushing his teeth as in shaving, making certain that all surfaces are covered. Certain tartar deposits will not come off by brushing and must be removed by a dentist.

Nutritional deficiencies manifest themselves by a diseased condition of the teeth, gums, and mouth. The soldier will have little opportunity for control of this matter as he is dependent upon the ration furnished by the government. Alert to the dangers, however, the medical officer in his inspections should determine whether it is a local or general condition, taking adequate steps to have the soldier visit the dentist or to admit him to the hospital if the condition warrants it. If the diet is inadequate or faulty, the medical officer should make suitable recommendations to the responsible commander of the soldier's unit.

The medical officer, as well as the dental officer, must be watchful for diseases of the gums. The soldier who fails to practice dental hygiene is particularly susceptible to infections of the gums and carious (decayed) teeth.

Pyorrhea alveolaris, commonly called pyorrhea or dental abscess, is the most frequent manifestation of dental sepsis. There are many theories as to the etiology, but all seem to agree that the disease starts as a disease of the gums or gingivitis. It may progress to the extent that the individual involved suffers from general debility, anemia, and loss of weight and strength, depending upon the resistance and tolerance of the patient to the infection. In the early stages pus forms along the margins of the gums and later there are deeper seated dental abscesses. Dental hygiene is specific prophylaxis.

Vincent's Angina, a highly contagious disease commonly known as trench mouth, may sweep through a command through the medium of inadequate mess kit sterilizing facilities. It is most frequently encountered in the individual who does not practice hygienic principles. It may have an insidious onset, since the organisms causing this disease are so frequently found in presumably healthy mouths. Although the disease is not seriously disabling in most cases, the lesions are sufficiently serious to demand every effort to prevent them. Because of its contagion, medical and dental officers must be alert to detect early cases and check sterilization of individual eating utensils in fact as well as in theory.

CARE OF THE SKIN

The hygiene of the skin is necessary for the normal function of its heat regulating and excretory mechanisms. Personal cleanliness is the most desirable of good habits and the mark of a superior person. The man who is attentive to cleanliness of his body, his clothing, his environment, and his food and drink takes the best insurance against sickness. Special attention is necessary for those parts of the body which are exposed to dirt and where perspiration occurs most freely. Routine bathing should include hygiene of the mouth and teeth. A clean body should be clothed in clean garments; clean underwear should follow every bath. Sleeping in underwear should be avoided when it is possible to wear night clothes. Cleanliness is chiefly a matter of habit. The person who really wishes to be clean will find a way to accomplish his desire even under the most discouraging circumstances.

Bathing is beneficial, not only on account of cleanliness but also for its physical stimulation. Neglect of bathing causes obnoxious body odors, promotes the development of skin diseases, and increases the chance of lice infestation. At least two baths a week should be taken; a daily bath is preferable and is definitely necessary in the warmer climates. During the bath special attention should be given the armpits, genitals, crotch, and feet. Shower baths are more sanitary than tub baths; tepid water is preferable to a cold bath. A daily cold bath is a fine tonic.

The cold bath (below 65 degrees Fahrenheit) acts as a stimulant. The proper time to take such a bath is before (but not immediately before) breakfast. The first reaction is to contract the extraneous vessels. Respirations are increased in depth and frequency, the pulse is slowed, and the nervous system stimulated.

Warm baths (90 to 98 degrees Fahrenheit) have the opposite action from cold baths. The skin vessels are dilated, perspiration is induced, pulse and respirations are increased in frequency, and the body temperature is raised. Such baths are very soothing and sedative. They remove muscular soreness and are most agreeable after severe physical exercise. Warm baths also help to induce sleep.

Hot baths (above 98 degrees Fahrenheit) should not be taken except on medical advice. If taken over too long a period they are very depressing and in some instances may produce unexpected complications.

Cleansing baths require the use of soap to remove the dirt, grease, or secretions of the body. Medicated and scented soaps are of little value. Practically all good grades of soap on the market have equal value. In order to get good results ample soaping must be used in a warm bath, and the soap then thoroughly rinsed away.

Shaving one's self is much safer than patronizing the average barber. The practice of

using the same accessories on several people is dangerous because sterilization may be lacking or inadequate.

Washing the hands is a "must" before eating meals and after visiting the latrine. Cooks and mess attendants (food handlers) must constantly be aware of this requirement and observe it invariably. Clean, individual towels should be used wherever practicable. A piece of clean paper is better than a dirty towel. If neither is available the hands should be rinsed in clear water, then dried by evaporation.

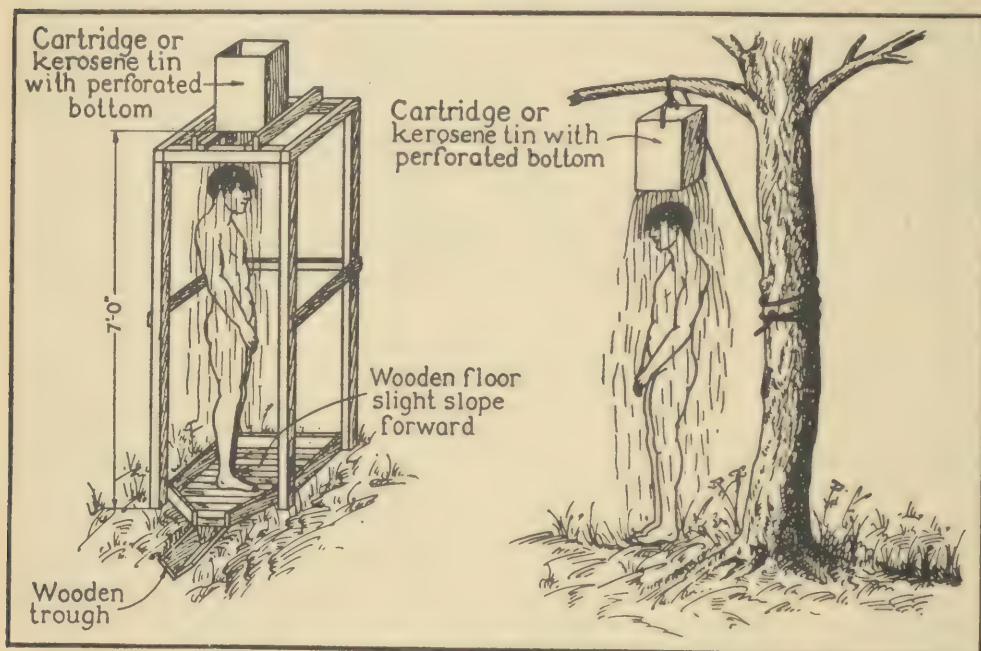


Plate 1. Improvised Shower Bath.

Care of the Hair. The hair should be cut short and kept neatly combed. The head should be brushed night and morning until there is a feeling of warmth in the scalp. Brushes should be kept clean. Frequent shampooing to remove dandruff and dirt should be practiced. Head gear should not be so tight as to impede the circulation of the scalp.



Plate 2. Toe Nails Properly Trimmed.

Care of the Nails. The nails should be kept cut short and clean. The nails of the toes should be cut straight across as shown in Plate 2. This important precaution, if observed, will avoid most of the trouble from ingrown toe nails. The cuticle of the nails should be pressed back at least once a week, thereby preventing hangnails which are the source of serious infections. If the skin is dry, any good skin cream or hand lotion rubbed into the cuticle will keep it soft and prevent chapping and breaking. A

nail brush should be used to clean the fingernails, followed by the use of a blunt instrument to remove any material which is lodged under the tips of the nails.

Clothing. Clothing that is loosely woven and is capable of holding considerable air in its meshes is a poor conductor of heat and consequently feels warm. For this reason wool is especially valuable for clothing. Another advantage of wool is its capacity for absorbing moisture without feeling wet. Evaporation proceeds slowly from woolen clothing, and as a consequence chilling of the body is prevented. Flannel underclothing for this reason is the most valuable in changeable climates. Some individuals find it necessary to wear such underclothing even in the tropics to prevent undue evaporation after excessive perspiration.

The color of clothing is important. Dark cloth absorbs heat, and white reflects it. For this reason light colored clothing is used in the tropics. Cheap aniline dyes in the cloth may produce skin irritation.

Underclothing should be washed frequently and be well dried. Damp garments afford excellent soil for the growth of micro-organisms.

Clothing should not be allowed to restrict the circulation. For this reason collars, belts, garters, and leggings which fit tightly should be avoided.

Rubber raincoats are useful as a protection against rain and wind. Since they are impermeable to air they are not useful in active occupations and while undergoing exertion. Cloth which is air-permeable but waterproof is better.

In cold weather operations, one must dress properly so as to conserve the body heat. A space of dry air next to the body keeps the heat in. Consequently, inner clothing should be of a loose, spongy weave, flexible and porous enough to hold a thick insulating layer of dead air. Outer clothing should not be heavy, stiff or bulky but should be of a texture that will act as a windbreak and enclose the warm air in the inner clothing. It should be loose enough not to interfere with free blood circulation and sufficiently porous to prevent the moisture of perspiration from condensing and freezing on the inner surface. Several layers of light clothing are much warmer than a single layer of equal weight. Under clothing should be of pure wool with separate undershirt and long drawers.

The usual pattern of overcoat is no good in extreme cold. It allows air to escape at the bottom, wrist, front and collar. A turned up high collar collects snow like a funnel. For cold weather operations, the outer coat or the parka should have a hood and a drawstring or belt. Provision should be made to close the front opening securely against air escapes. Sleeves should close snugly but not tightly at the wrist.

The hood of the parka should not be worn close around the face. The typical Eskimo hood merely covers the ears and leaves the whole forward half of the head unprotected. The first improvement usually tried by a white man is to have the hood come farther forward so as to fit snug about the face and leave but a small part of it exposed. The result is that if the hood comes out to the cheek bones and to the point of the chin, a circle of hoarfrost forms on the face along the edge of the trimming of the hood, and presently the skin under the hoarfrost ring freezes. On the other hand, if the face is completely bare there is a sufficient distance between the nose and mouth on one side and the trimming of the coat on the other so that the breath in very cold weather freezes before it reaches the trimming of the coat and settles upon it in the form of snow, which can be brushed off, rather than in the form of ice as when the trimming is only an inch or two from the face.

Fingers numbed from cold greatly impair a soldier's efficiency and gloves warm enough for habitual wear are too bulky for the proper handling of instruments or weapons. It is also essential to protect the wrists in very cold weather if the hands are to be kept warm. The most generally suitable protection for the hands and wrists consists of the following combination:

A loosely woven woolen mitten extending well above the wrist is worn next to the hand. The mitten should be so constructed as to provide a thumb compartment, a trigger finger compartment, and a compartment large enough to accommodate all fingers and the thumb comfortably when the trigger finger is not in use for firing purposes.

The mitten may suitably constitute the inner lining of a gauntlet which is worn over the mitten in very cold weather. The back of the gauntlet should preferably be constructed of light water repellent (not waterproof) material the palm and gripping surface of the finger compartment of pliable leather. The gauntlet should extend above the wrist and be provided with a closure at its upper extremity. This closure should not restrict circulation, yet it should give protection against cold. The wearer should be able to fire his personal weapons without removing the gauntlet.

Clothing selected for jungle service should have a minimum capacity for heat absorption and a maximum capacity for the circulation of air to permit the evaporation of perspiration from the body. The wearing of clothing wet with sweat for long periods of time may result in fungus infections or skin irritations such as prickly heat. Prickly heat or heat rash may be prevented by scrupulous cleanliness of the skin, by daily bathing in water in which baking soda has been added, by the use of borated talcum powder, and by daily change of clothing.

Tight fitting clothing is not desirable since such clothing is hot and restricts movement. The woolen olive-drab shirt, regulation khaki trousers, canvas leggings and field shoes are suitable for jungle service. A heavy, loosely woven cotton shirt is better than the woolen one since it resists snagging and fungus rot better and is cooler. The head should be protected from the rays of the sun by a hat which permits free circulation of air about the scalp and which is broad enough to protect the face and neck from the sun's rays. The tropical helmet meets these conditions. For combat the steel helmet is worn.

The present authorized clothing, both summer and winter is suitable for desert operations. The summer uniform, however, might be modified to conform more to the British or German type—the principle characteristics of which are the light weight material, open necked, short sleeved shirts, shorts, and wool half stocking. This uniform allows a free circulation of air around the body, has no ill effects on the health of the troops, and does not result in excessive sunburn. It does not expose large parts to attack by sand flies. Because of the wide temperature range and the cool nights some sort of woolen garment is needed for wear at night during the hot season. A woolen band around the stomach even on the hottest day seems to be absolutely necessary in order to prevent a so called "stomach chill."

Head gear used by desert troops must have two necessary characteristics, namely, provision of air space and a shield for the eyes. The steel helmet is of course worn during combat.

Care of the Feet. If the soldier cannot march he is of little value. The condition of the soldiers' feet is most important to the Army. Battles may be won or lost because of the marching ability of the troops.

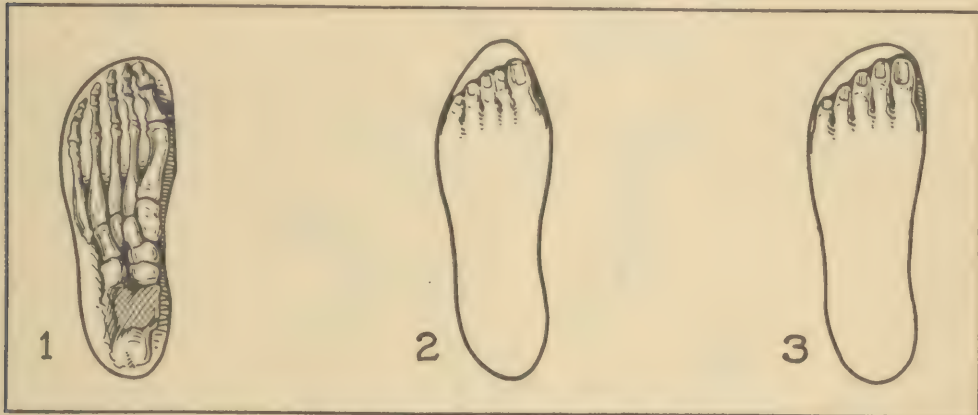
The condition of the feet of the men of an organization is the direct responsibility of its commanding officer, who is required to inspect them frequently. Every effort must be made to prevent and correct foot disabilities. Relatively serious defects usually require medical treatment, and men having such defects are hospitalized and treated. However, the occurrence of many of the disabling minor defects of the feet can be prevented by proper shoe and sock fitting and the care of the feet.

The fit of shoes is of the greatest importance. A well-fitting pair should have the inner sides nearly parallel; the outer sides should have a gentle curve inward, and the toes should in no case be pointed. They should be about $\frac{3}{4}$ inch longer than the foot (Plate 3). The leather should be moderately thick and pliable and the heels broad and low.

It must be remembered that marching and field shoes must be fitted with the knowledge that when a pack is carried by the soldier the foot is spread out and enlarged. Marching also causes the foot to swell. Field (service) shoes should therefore be larger than ordinary civilian or garrison shoes. Only the standard Army shoe should be worn by the soldiers, and it must be fitted as described in the following paragraph.

The fitting of each pair of shoes is supervised by a company officer. Each shoe is fitted to the foot of the wearer so that no undue constriction or pressure will occur

at any point when the foot is expanded by the superimposed weight of the body and pack. Shoes are also fitted so that at no point is there sufficient space between the shoe and the foot to permit chafing. Owing to the structural irregularities of the foot and variations in standard shoe sizes, shoes can be properly fitted only by actual test. Testing may be accomplished either with a shoe fitting machine, or by hand, and is done under the direct supervision of an officer. The shoe fitting machine is a device for measuring the size of the foot when bearing weight and for proving that the size selected is the proper one. These machines are issued as required. Instructions for their operation accompany the machines or are issued by the proper headquarters.



1. Effect of too short a shoe. 2. Effect of pointed toe shoe. 3. A good foot in a well fitted shoe.

Plate 3. Anatomical Study of Shoe Fitting.

Shoes may be fitted without a machine. (See Plate 4). The shoe should be laced snugly; the wearer with a 40-pound burden on his back then places his entire weight on one foot. To determine the correct width, the leather of the shoe in front of the instep above the ball of the foot should then be grasped between the fingers and thumb. As the finger and thumb are brought together the leather should be loose enough to prevent the fingers slipping easily over the surface but not sufficiently lax to produce a wrinkle. If it wrinkles under the grasp, the shoe is too wide, and if there is no looseness apparent it is too narrow. The proper length of the shoe is determined by the space between the end of the great toe and the end of the shoe, which should be not less than three-quarters of an inch clear space when all the body weight plus that of a 40-pound burden is borne by the foot being fitted. This space is measured by pressing down the leather with the thumb. The width of the thumb may be considered as representing the desired clearance between the toe and the end of the shoe.

New shoes should not be used on a march. Shoes should always be "broken in" first. They may be waterproofed with neatsfoot oil. Waterproofing shoes makes them impermeable to air; therefore, men whose feet tend to perspire should not use waterproof leather. Shoes may be broken in rapidly by standing in about 2½ inches of water for five minutes and then walking about, allowing the shoes to dry on the feet.

Fitting of the socks and the choice of socks is but little less important than the shoes. The best socks for general field service are light weight woolen. Like shoes, they must be properly fitted—large enough to permit free relative motion of the toes but not so large as to wrinkle when the shoes are worn. The proper sock size of woolen socks for a given shoe is indicated in the accompanying table. Cotton socks shrink less after washing and should accordingly be one-half size smaller than shown in the table.

Socks should be changed frequently; on the march a clean pair of socks should be put on every day. It is advisable to change socks and shoes twice a day whenever



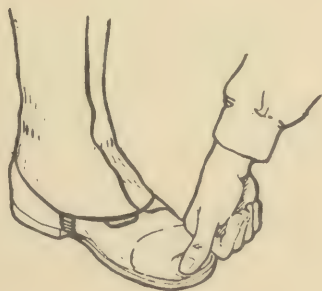
Correct



Too wide



Too narrow



Correct



Too short

TABLE OF SOCK SIZES, WOOL SOCKS

<i>Shoe size</i>	<i>Corre- sponding sock size</i>	<i>Shoe size</i>	<i>Corre- sponding sock size</i>
5	10½	9	12
5½		9½	
6		10	
6½		10½	
7	11	11	12½
7½		11½	
8		12	
8½	11½	12½	13
		13	

practicable, in order to keep the feet dry and to allow the shoes to air out. The shoes and socks should be exposed to the sun during the interim to permit destruction of any possible fungi of athlete's foot. Socks with holes should never be worn on the march.

Bathing the feet deserves special attention. Rinsing off all the soap from the feet and drying them well about and between the toes will assist in preventing many of the

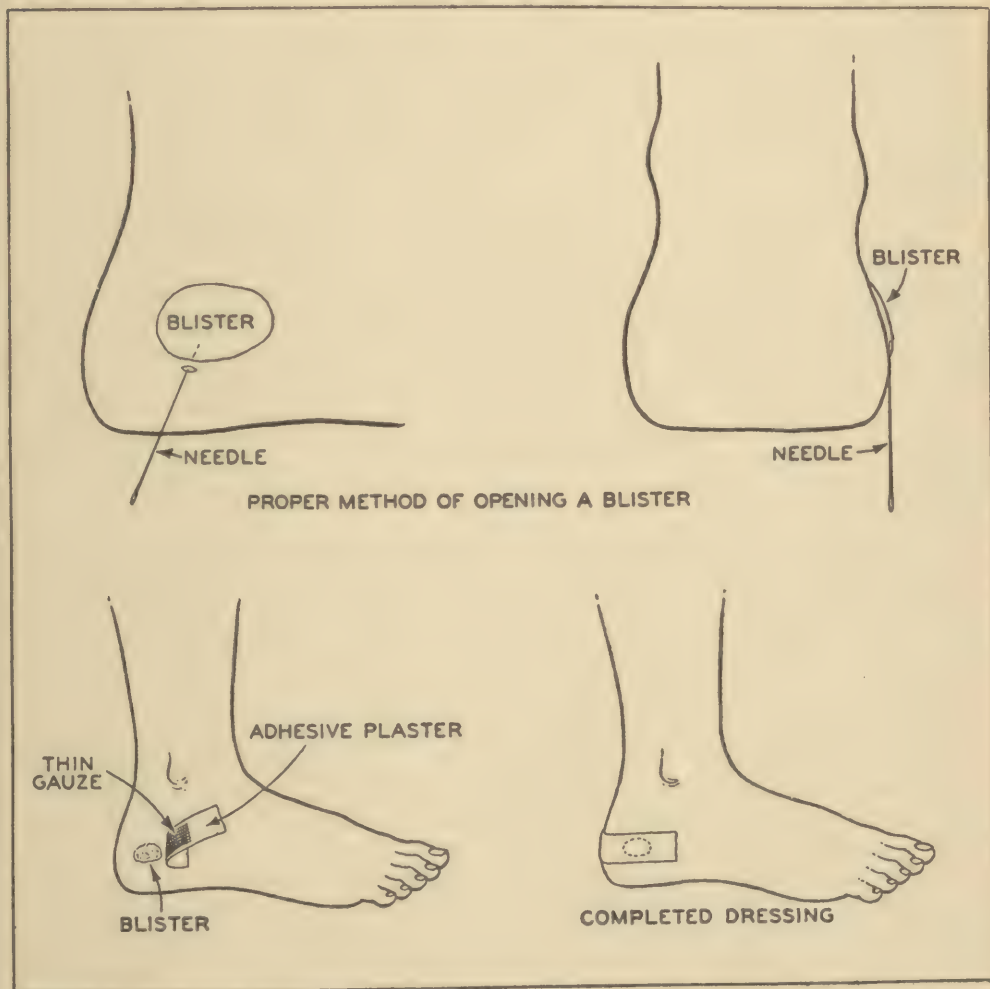


Plate 5. Care of Blisters on Feet.

cases of so-called "athlete's foot." In this connection exposure of the feet to the air and mild progressive doses of sunshine increases the resistance of the skin to infection. The use of dry, clean socks and shoes is necessary after bathing and drying the feet. At the end of a march the feet should be washed, preferably in cool water, and rubbed briskly with a towel. Foot powder (available for issue to the troops) prevents chafing of the feet and assists in keeping them dry. The nails after bathing are soft and if they need trimming it is a good time to do so.

Blisters of the feet are most frequent among recruits who are not accustomed to long marches and who have not learned the essentials of the proper care of their feet. They are first manifested as a reddened, tender area; at this stage, if such areas are well covered with smoothly applied adhesive plaster, further damage may be prevented. When the blisters contain fluid they should be opened with a sterilized needle inserted through the undamaged skin just outside the margin of the blister. The fluid is allowed to escape, but the loosened skin should not be removed. The area should then be well covered with one or two layers of sterile gauze and then covered with zinc oxide (adhesive) plaster, smoothly applied (Plate 5). The gauze prevents adhesion between the loosened skin and the adhesive plaster. A man can march with a blister which has been properly treated. Company officers should know how to treat blisters on the feet. Blisters on the feet are prevented by the use of well fitted shoes and socks and proper hygiene of the feet.

For operations in the far North. The average soldier will need shoes about two sizes larger than those worn during warm weather. He should wear two pairs of light wool socks, a pair of heavy knitted wool socks, a burlap boot sock and an insole of felt or preferably of burlap. Too much emphasis cannot be placed upon the importance of having the shoes fit loosely. It is better to discard a pair of socks than to bind the feet too tightly.

Shoes should not have a permanent lining of fleece, felt or anything that will collect moisture. The Eskimo foot gear consists of a caribou skin sock with the fur turned in, and a caribou skin boot with the fur of the sole turned in also and the fur of the leg turned either in or out. This makes ideal foot wear not only in the matter of warmth but also in lightness and comfort. Eskimos also wear foot gear ("mukluk") with the sole of rawhide made from the skin of a bearded seal, and uppers of reindeer skin ending in a drawstring just below the knee. The fur is on the outside. Rawhide thongs bind the "mukluk" snugly at the ankle. For extreme temperatures, a boot of commercially available substitutes should be made according to the "mukluk" pattern and issued to troops. Light rubber bottoms of non-freezing type of rubber and calfskin uppers, with the hair outside, will answer the purpose. "Mukluks" are suitable for snowshoeing.

In the absence of a burlap boot sock, a strip of burlap cut from a gunny sack can be wound loosely outside the socks and over the feet and ankles. Dried grass stuffed loosely into the shoe outside of the socks also makes a splendid insulating material. Indians and Eskimos frequently employ this method of keeping their feet warm, throwing away the used grass every night and replacing it with fresh grass in the morning.

Men will occasionally find it necessary to wade across shallow streams or overflows while wearing shoes that are not waterproof. In temperatures of extreme cold, shoes may be made temporarily waterproof by dipping them into the water and quickly withdrawing them so that a thin coating of ice covers the leather. Individuals can then wade quickly across. The ice will soon crack off the shoes. This is a well-known expedient among the Eskimos.

For operations in jungle. Before beginning jungle operations men should be provided with new shoes that have been well oiled to protect them against wet rot. The feet of the men must be inspected frequently for jiggers, evidences of hookworm infestation and especially for trichophyton's ("Dhobie"). A plentiful supply of socks should be available and troops should be required to change socks frequently. Before wading streams, the men should remove their shoes and hang them around their necks or shoulders. This

helps to save shoe leather during the dry season. During the "rainy season" this is of no value, as the shoes are continuously wet anyhow. Where the waters are suspected of being infected with the cercariae of the *Schistosoma*, the men should not be permitted to wade barefoot thru the stream. In fact, even clothes unless waterproof, are no protection to the wader. If possible—particularly for engineers working in such water—protection should be provided by wearing rubber thigh boots and rubber gloves.

HYGIENE OF THE RESPIRATORY APPARATUS

Respiration is one of the characteristics common to all living animals, for it is essential for the chemical changes of metabolism upon which life depends. The body may survive for long periods of time without food but only a few moments without oxygen. The condition of the body and mind will affect the respiratory rate, increasing or decreasing the rate of oxygen and carbon dioxide to the needs of the tissues. Involved in the act of respiration are the nose, throat, trachea, bronchi, and lungs. Health of these vital structures is necessary for proper metabolism.

A healthy nose requires no treatment by means of sprays, nasal douches, and the like. Catarrh of the nose and accessory nasal sinuses is caused by exposing to cold, to dust, and to atmosphere that is too dry, such as in heated houses. The best defense is a healthy body, the avoidance of over-exposure to cold and dust, and the artificial addition of moisture to air that is too dry (air-conditioning). Allergic reactions of the mucous membrane may occur with swelling of the lining tissues of the nose, or obstruction may be due to a mechanical defect requiring a surgical procedure. If persistent, medical advice should be sought.

Serious infections of the hair follicles on the inner surfaces of the nose may result from the picking of dried secretions which are adherent to them. It is better to moisten the hairs and clean the surfaces with a soft cloth. Picking the nose is a very unhygienic habit. If infection does occur do not open the infection without consulting a physician as infections of this part of the face improperly treated may lead to fatal results.

The nose performs an important function in warming or cooling the air before its entrance to the lower air passages. Obstruction which causes mouth breathing, such as enlarged adenoids, should be removed by surgical operation. This should be done as early as detected to prevent formation of other nasal affections and to lessen the susceptibility to upper respiratory disease.

When frequent inflammation and soreness of the throat occur, the individual should have his throat inspected by a medical officer who can determine whether the tonsils are the cause. He can decide whether it is advisable to have them removed. Infected tonsils may cause halitosis (unpleasant breath) or may be the source of other body ailments due to the distribution of infective organisms to the blood stream. Upper respiratory infections may lead to more serious complications such as bronchitis and pneumonia.

The purity of the air inhaled is of vital importance to the health of the lungs. Dust is detrimental to health, and dusty atmospheres should be avoided. Nose breathing rather than mouth breathing will remove many of the dust particles and bacteria since they lodge on the hairs inside the nose. In ordinary amounts they are removed by the reverse action of the *ciliated epithelium* in the bronchial tree that works mucus and dust particles toward the throat and mouth, and by coughing. Irritating substances will cause sneezing, initially, and coughing and sneezing if inhaled in greater concentration.

Pathogenic microbes are constantly inhaled. Among these are the germs of pneumonia, influenza, and tuberculosis. The best defense against these diseases depends on the maintenance of a high standard of bodily health. One should avoid being with the sick unless duty requires it. "Droplet infection" is the means of the spread of respiratory diseases. One should be careful in coughing and sneezing; in attending the sick guard against exposure through these means. Fresh air is necessary at all times and should be sought in abundance. All rooms should be well ventilated and plenty of fresh air allowed to enter at night. The old superstition about "night air being dangerous to health" is faulty.

Deep breathing exercises are of value in preserving health. The best exercises, however, are those which develop the entire body and not the lung capacity alone. Among those are: running, calisthenics, drill, boxing, vaulting, volley-ball, swimming, hand-ball, squash, baseball, tennis, golf, and football. Vigorous walking is an excellent exercise in which all may indulge wherever stationed, and therefore no officer or soldier should offer as an excuse the lack of equipment for securing adequate exercise.

CARE OF THE EYES

The eyes are one of man's most priceless possessions and should be protected and maintained in normal health as long as life exists. With them most of his pleasures and joys of life become a series of happy pictures that build up a book of not so easily forgotten memories.

Injuries to the eye may be very serious if they involve a penetration of the eyeball. Protective glasses should be worn while engaged in an occupation, such as work on an emery wheel, in which foreign particles may be thrown off to penetrate the eyeball or tissues surrounding the eyeball. The removal of foreign bodies from the eye is related in Chapter VI. Never rub the eyes, as there may be disease germs on the hands. The conjunctiva is very susceptible to infection or injury.

Eye strain from visual defects not only causes local symptoms referred to the eye but constitutional ones such as headache, nervousness, indigestion, insomnia, and dizziness. It goes without saying that usual defects and muscular unbalance of the eyes should be promptly corrected.

In reading and close use of the eyes the lighting conditions are important. The light should be on a level with the top of the head and should illuminate over the shoulder. The proper reading distance is about fourteen inches from the eye. The book should be held nearly on a level with the eyes. Reading in the recumbent position should not be practiced. There is extraordinary strain on the muscles of downward rotation, and the flexing of the neck causes congestion of the eyeballs.

Color blindness is usually inherited but may be due to injury or disease. The presence of adequate vitamins is now considered necessary for the proper color perception.

Night operations require special training of the troops in observation in the dark. As all individuals do not adapt their eyes to darkness at the same rate of speed, it is desirable for commanders to know what persons have faulty night vision. Certain factors are essential for dark adaptation. Oxygen is necessary and troops going to high altitudes, even as low as 4000 feet, should carry an additional supply. The diet should have sufficient vitamins A and D. Deficiency of either oxygen or vitamins will impair night vision, but an excess of either will not give keener perception. The time period for dark adaptation can be shortened by avoiding bright lights, noise, and fatigue.

CARE OF THE EARS

The ears comprise the auditory apparatus and the sense of equilibrium. Disease of the ear often manifests diseases in other parts of the body. Personal care of the ears will assist in preventing affection due to local injury and disease.

Wax or cerumen often collects in the ear. It decreases hearing and may cause inflammation of the auditory canal. Dizziness sometimes arises from this cause. Careful syringing with hot water (105 degrees to 115 degrees Fahrenheit) is the proper procedure for removing the wax. For further details about removing foreign bodies from the ear see Chapter VI.

Scratching the ears, or the habit of inserting the fingers vigorously into the external auditory canal, may be the cause of spreading mycosis infections into the canal and to the ear drum. Handling of the ears should be done with clean hands, and the canal should be kept free of obstruction. Difficult removal should be done only by a physician who has the proper instruments.

Earaches sometimes arise from exposure to cold air or cold water. Nasal douches are at times the cause of inflammations of the ear. The treatment of earache more properly

belongs in the realm of medicine rather than hygiene. Suffice it to say here that the application of external heat and the use of warm sterile water for syringing may be beneficial and clear up the condition. If, however, earache is combined with infection of the throat there is possibility of infection of the middle ear. This condition deserves immediate and constant attention by responsible medical authorities.

Therefore, in caring for the ears, cleanliness by gentle procedures, the avoidance of excess exposure to cold, and the prevention or removal of foreign material are the essential features of their hygiene.

SLEEP

The waste products of activity appear to be a prime cause of sleep. It is during sleep that nature repairs the damages incident to the day's activities. It is therefore readily apparent that an adequate amount of sleep should be secured by a person if he expects to maintain efficiency and preserve his vitality. The average person requires seven to eight hours of sleep in twenty-four hours, and it should be taken at regular intervals.

To obtain the utmost benefit sleep should be had under favorable conditions—fresh air, clean bedding, and no crowding of sleeping quarters.

PHYSICAL EXERCISE

Purpose. The effect of exercise on the muscles is to exhaust the material necessary for contraction and the accumulation in the muscle of waste substances produced by its activity. The blood supply to the muscle is greatly increased. The value of muscular exer-

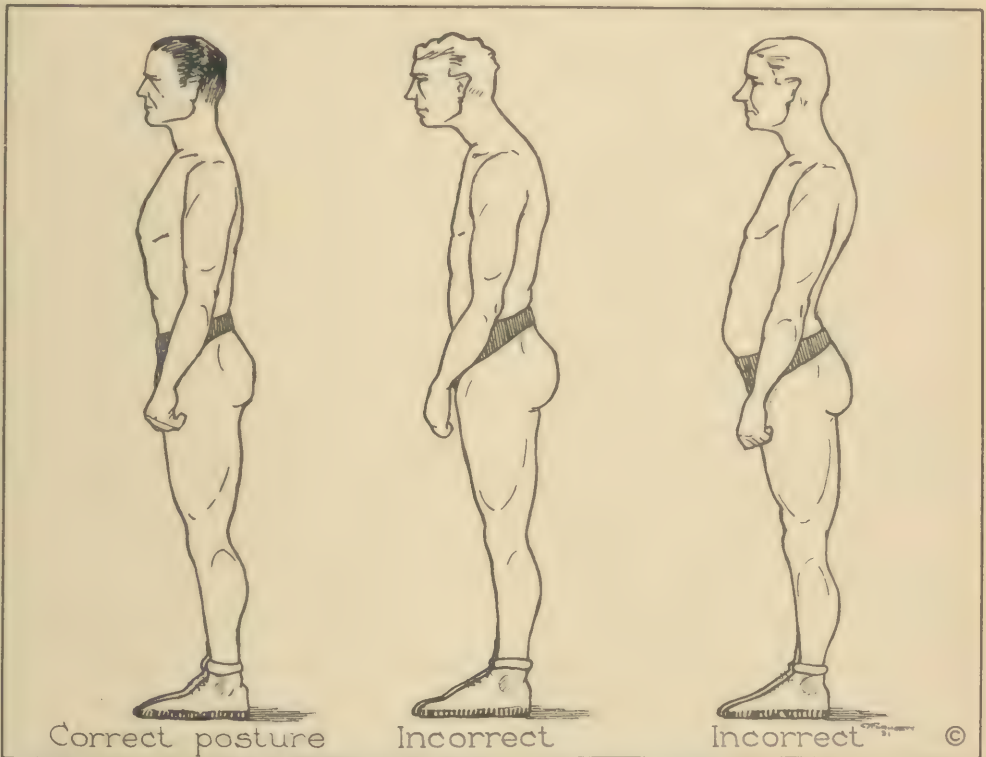


Plate 6. Correct and Incorrect Body Posture.

cise lies partly in the fact that the education of nervous centers which have to do with the perception of ideas and with intellectual operations would be extremely incomplete in the absence of education of the centers connected with muscular movements. Exercise also stimulates the heart, accelerates breathing and aerates the lungs, dilates the blood vessels

of the skin, and causes sweating thus stimulating excretion of waste products through the skin, and increases the appetite and promotes digestion.

Posture. The normal posture, without drooping of the shoulders or twisting of the trunk, is the one in which there is the least possible strain or friction no matter what the amount of physical labor. Consequently in this position there is the greatest amount of physical efficiency. Any departure from the normal means waste of energy and lessened efficiency of the individual, both mental and physical.

The position, in the army termed "the position of the soldier," is the normal position of the body. (Plate 6.)

The proper use of exercises, such as obtained in drill and in calisthenics, will improve and correct the posture by stimulation and employment of muscles that are not used in the ordinary roles of occupation. A well performed training exercise will involve to some degree all the muscles of the body.

WEIGHT AND HEALTH

There is a very close relation between weight, health, and longevity. There is a proper weight for every height, and if one weighs very much less or especially very much more than is normal he is more subject to disease and the chance that he will not live as long as if his weight were normal. Consideration must be given of the bony structure and frame of the individual, because his weight may be considerably more than his height would indicate, but still he may not be fat (obese). Obesity is the primary cause for detrimental effects of overweight above the normal standard as shown in the accompanying table. This table gives the ideal proportion in height (inches) and weight (pounds) for young men with the average type of bony and muscular frame:

TABLE OF NORMAL HEIGHT AND WEIGHT FOR A YOUNG MAN

Height (inches)	Weight (pounds)	Height (inches)	Weight (pounds)
60	120	70	156
61	122	71	161
62	125	72	168
63	128	73	175
64	131	74	182
65	135	75	189
66	139	76	197
67	143	77	205
68	147	78	213
69	151		

A sudden drop in weight to the extent of ten pounds deserves immediate medical investigation. Exercise and climatic changes will account for small variations in weight; however, the weight should be closely guarded and maintained as near the ideal as the body frame will permit.

HYGIENE OF THE GENITO-URINARY SYSTEM

The genito-urinary system of the male is a complicated mechanism which suffers quickly from abuse. Cleanliness of the external genitalia is extremely important, since the crotch perspires freely, and this moisture tends to collect dust and dirt particles. This moist area also provides a good media for the culture of fungus infections, and caution should always be taken after a bath to dry this area before drying the feet, where athletes' foot disease may be present.

If the foreskin is long, care should be taken to remove the collection of material around the tender portion of the penis by rolling back the foreskin and washing the parts with warm water and a mild soap. Thorough drying with a soft towel should follow. Failure to clean the under surface of the foreskin may lead to infection and abscess formaton. The operation for the removal of the redundant portion of the foreskin (circumcision) is not difficult and not disabling. The individual with an excessively long foreskin who has difficulty in maintaining cleanliness should subject himself to this

type of operation. In some cases it will tend to relieve irritation which may cause priapism and incite masturbation.

Sexual Hygiene. The force of the sex impulse reaches its maximum between the ages of twenty and twenty-five. The vigor of the sex instinct and the powers of control are hereditary, but the vigor with which a man will apply the brake rests upon his enthusiasm in support of the idealism in which he was reared. A large proportion of mankind has masturbated to some extent at some period in their lives, and probably less than ten per cent of such masturbators have been physically injured by the habit. Masturbation is indulged in excessively more often than sexual intercourse since the latter requires the consent of two individuals and opportunities which are comparatively hard to find. Relief from this habit is best obtained by absolute purity of thought, and subsequent marriage, to regulate sexual hygiene. Encouragement to continence should be supplemented by active physical and mental exercise, sanitary living conditions, and social contacts that avoid sexual stimulation. The happily married man rarely complains of any disorder of the genito-urinary system. No instruction in this subject can equal that of the parent, whose moral influence outweighs all the angles of amateurishness. Every man has the right to know the essentials and importance of sex life, and what is not learned from the pure source will invariably be completed from the wrong source.

Venereal Disease. Sexual indulgence by young unmarried men is responsible for an immense amount of disease and suffering. This is true not only among the men themselves, but also in later years among their wives, to whom they give the disease although they may believe they have been cured, and among their children, to whom the malady may be transmitted even before birth. Abstinence from sexual intercourse is the only sure means of maintaining sexual purity and hygiene. While it is a common belief that the sexual act is necessary to maintain the health or powers of man, this is a fallacy having no foundation in scientific fact.

If the individual about to participate in illicit sexual intercourse would first consider that venereal disease attacks more than half of the young men, affects thousands of children, and hundreds of thousands of women, that his chance of remaining free after intercourse is less than 30 per cent, he would at least take all the preventive and prophylactic measures available. Gonorrhea causes at least 50 per cent of the involuntarily sterile and destroys the power of procreation in man as well as in woman. Add to that the perils of syphilis, chancroids, and lymphogranuloma inguinale and it would appear there is little reason for failure to take necessary precautions, or better still abstinence.

If, in spite of the moral and physical prohibitions against it, illicit sexual intercourse has been indulged in, then a prophylactic treatment should be taken. This is for the benefit of the person himself and for the good of the group as a whole. Treatments should be taken as soon after intercourse as practicable, certainly not later than two hours after initiation of sexual intercourse. One hour afterward has proven to be the maximum limit to which full benefit from prophylaxis is received.

Sexual information should be sought from the proper sources, and especially accurate information regarding the spread of venereal diseases, their effects on the human body, and the methods of prophylaxis. For further details about venereal diseases, their prevention and control, see Chapter IV.

CONDITIONING OF TROOPS

In modern warfare troops must be carefully trained for the special tasks that confront them and for service in every part of the world. Task forces intended for the desert and jungle require a period of gradual conditioning of at least 6-8 weeks to become acclimated to the increased temperatures, to the greater power of the sun's rays; and in the jungles, to the heavy rains and humidity. As a further hardening process, two or three months additional training under actual jungle or desert conditions must be carried on before troops can be considered ready for special operations in jungle or desert warfare. It is reported that the Japanese trained for about one year on the tropical island of Hainan, off the China coast, before starting their operations in the

Philippines and Burma. The Germans trained the men in their Afrika Korps by exposing them to extremes in temperature, to long hours in tanks, to long periods without water, to a fierce unending wind sandpapering their faces with desert sand and to actual hardships in the desert.

Special Problems of Jungle, Desert, and Extreme Cold. *Jungle.* In the tropical jungle the soldier is exposed to high temperatures, high humidity and the burning rays of the sun. He must be protected against poisonous plants, noxious insects and poisonous reptiles. The humidity and temperature cause considerable sweating and loss of salt from the body. This may produce heat cramps unless additional salt is added to the food and water. Chilling of the body will occur unless wet clothing is changed as soon as possible and the body dried during the change. Men should sleep off the ground and under a mosquito net. The head should be protected from the rays of the sun by a hat which permits free circulation of air about the scalp and which is broad enough to protect the face and neck from the sun's rays. A head net must be worn. Gloves which are impervious to mosquito bites should constitute a part of each soldier's equipment. Raincoats are impractical; however, a small poncho of light weight, water proof fabric is highly desirable in rainy weather. Shoes should be well oiled to protect them against wet rot. Where the waters are suspected of being infected with the cercariae (larvae) of the *Schistosoma*, the men should not be permitted to wade barefoot through the stream. In fact, even clothes unless waterproof, are no protection to the wader.

Enteric fevers are a serious cause of non-effectiveness among military personnel in the jungle. The use of water and food from native sources should be prevented. Every precaution must be taken to insure proper cleaning and sterilization of the mess gear. Insect borne diseases constitute a major problem for troops operating in the jungles and of these malarial fevers head the list. Chemical prophylaxis against malaria is not recommended as a routine measure. It is only carried out in emergencies when screening is lacking or defective and when troops operate in highly malarious districts without any possibility of applying effective control measures against the mosquito. Quinine and atabrine do not prevent infection but they do keep the men on their feet and achieve the object of keeping them fighting and bringing them back again from the malarious district before the active symptoms of malaria are manifested. Five to fifteen grains of quinine given daily for 7 days under the supervision of an officer, at the time of the evening meal, is the usual procedure in prophylaxis. The soldier is then given a rest period of several days with no drug. Atabrine may be substituted, giving 3 grains every three or four days. Special duty men working in kitchens or on picket lines at dawn or at dusk or men sitting around company canteens at night, should be carefully protected by requiring them to use gloves, head nets and chemical prophylaxis to prevent infection, as they are much more exposed.

Leeches both terrestrial and aquatic may become quite a nuisance to troops and sand flies may be more irritating than mosquitoes. Venomous reptiles are a constant source of danger and troops must be cautioned against walking around barefoot, against placing their hands on ledges and logs where they are unable to see what is there. In each squad there should be at least one man qualified in giving emergency treatment against snake bites. Every native village must be assumed to be infected with every type of venereal disease, intestinal and insect borne disease. Villages and native huts must therefore be shunned by troops, and patrols must be placed to see that troops do not enter for pleasure purposes. Camping in the vicinity of native villages is an undesirable procedure. The camp should be at least one mile away and swampy areas must also be avoided.

Desert. In the desert the soldier is exposed to a temperature of 130° F. in the shade during the day and to a chilly cold at night. He must protect himself from heat exhaustion and sun stroke and from the whirling sand that sifts into everything.

Head gear used by desert troops must have two necessary characteristics, namely, provision for air space and a shield for the eyes. Special individual equipment which will add to the comfort and efficiency of the men are goggles, respirators, sun glasses,

neck cloth, nose cloth and fly switches. Goggles and respirators are a necessity for all vehicle drivers, and will add to the individual comfort of others, particularly during sand storms. Good sun glasses are desirable for all individuals, but must be provided for all aircraft and antitank gun crews and lookouts.

The Arabs, as a result of centuries of desert life, wear a cloth to protect the back of the neck from the rays of the sun, and a cloth over the nose to protect the lungs from sand and dust during storms. Horse fly switches are in almost universal use among the British desert forces, for protection against the clouds of sand flies.

An adequate water supply is a problem which dominates all others in desert operations. Restricted water consumption must become a habit developed through training. Many of the sources of water supply in the desert furnish water of a relatively high salinity. Troops must become accustomed to drinking such water particularly since it is necessary to add salt to the normal supplies to make up for losses due to excessive perspiration. Hot sugared tea reduces thirst. Smoking increases the desire for water. In emergencies, men conditioned to desert conditions can operate for as long as five days on a quart of water per man per day, if traveling is done at night, and they can find shade during daylight hours. On such a ration combat efficiency is seriously lowered.

It should be understood that except during actual combat, the bulk of the troops are normally not in the desert proper, but in areas closely adjacent to it. In such areas native populations predominate, sanitation is poor, and many diseases thrive; of particular importance to our troops are the dysenteries, malaria, sand fly fever and the venereal diseases. Bacillary dysentery, in particular, has been prevalent among troops serving in Libya. In those areas in which sanitary regulations have been strictly enforced there have been no epidemics. Malaria is present in all areas adjacent to the desert and is found in most oases. Permanent mosquito measures while desirable, are not practicably, and secondary and individual measures must be used. Segregation of troop quarters from native populations, rigid use of mosquito bars, sleeping boots, gloves, head nets, proper screening, daily early morning spraying and the prophylactic use of quinine or atabrine when indicated will prevent excessive losses from this disease. Body lice are prevalent among the natives and typhus epidemics have occurred in the past in all settlements near possible desert theatres of operations. A large number of men also suffer from multiple sores during the hot season. The cause is obscure but the association with very hot weather is definite and it would seem to be a matter of infection predisposed by a shortage of water for washing, sweating and possibly flies. Many parasites are found in these areas but of particular interest to the medical officer are the Schistosomes. Medical officers must take every precaution to the end that our troops do not become infected. They must impress commanding officers with the importance of the problem and they must recommend the avoidance of any kind of personal contact with water that may be infested. All unfiltered water from infested sources is dangerous unless it has been stored for at least 48 hours after being drawn. Methods of clarification either by sediment action with alum or filtration through cloth or sand filters do not hold back the cercariae (infective forms of this disease)—which are known to penetrate through three feet of sand. However, chlorination which provides a residual of 1 p.p.m. of chlorine after a thirty minute waiting period provides a safe water.

Zones of extreme cold. In zones of extreme cold men are subject to chilling, to frost bite, to freezing and to snow blindness. When cold they become dull and less keen. Scurvy is a dietary deficiency disease from which we have much to fear in these areas if it is not possible to maintain a ration of fresh meats, milk, fruits and vegetables.

Violent exertion and overheating may cause the soldier to freeze to death. In such cases, the inner clothing becomes saturated with moisture from perspiration. Water is a good conductor of heat and the moisture laden clothing soon draws the heat out of the body and then freezes hard. To keep the face from freezing it must be smooth shaven. If a beard is worn, the moisture of the breath congeals on it and makes the face an ice mask separated by an air space of a quarter inch from the skin. This makes it

impossible to get at the skin to thaw it out if it should begin to freeze. The secret of dealing with frost bite of the face is to keep the hands warm and when the weather is severe to run the hands over the face every few minutes to see if any part of it is frozen. Frozen parts should not be thawed out by the application of snow. Hands and wrists must be protected with warm gloves and mittens. When the hands are not in use, holding a handful of dried grass or straw in each hand will aid in retaining warmth. A pocketful of dried grass is well worth carrying along. Tight shoes result in frozen feet. The average soldier will need shoes about two sizes larger than those worn in warm weather to make room for the bulk of the socks that must be worn to keep warm. It is better to discard a pair of socks however, than to bind the feet too tightly. Blankets are insufficiently warm for extreme cold weather. Down filled sleeping bags are the warmest protection for their weight obtainable. They must be thoroughly dried out however at least every three days because moisture tends to condense in them. They should not be placed directly on the snow. When arising after lying down, sitting or kneeling, men should be taught to dust snow from their clothing so that it will not thaw and cause dampness.

Going to sleep while cold and tired is not dangerous but beneficial unless the soldier is completely exhausted. The sleep will rest the tired man and the cold will waken him before he freezes. He may then move about to reestablish circulation and take another nap.

In temperatures below minus 30°F., deep, rapid breathing resulting from exertion, sometimes causes frosting of the lungs. While this condition is usually not fatal, it may incapacitate a man for several days. The air entering the lungs will be less cold if the men breathe simultaneously through the nose and mouth, placing the tip of the tongue against the roof of the mouth, and allowing the air to flow around it when inhaling.

The reflection from snow surfaces causes snow blindness unless snow glasses are worn. This may occur in overcast as well as in sunny weather. Amber or yellow goggle are superior to blue, green, smoked or any other variety. The Eskimo goggles are made of pieces of wood with two narrow slits for the eyes, each large enough for a half dollar to be slipped through. If no glasses are available and improvised ones along the Eskimo pattern cannot be made, some protection will be afforded by blackening the skin around the eyes.

In operations in extreme cold, there is great danger from carbon monoxide poisoning from ill ventilated quarters. Louse infestation is common and heated shelters should be provided where men at least take sponge baths with soap and warm water. Facilities for washing underclothes and socks should also be furnished. Where men are infested, disinfestation must be promptly and energetically carried out.

Mosquitoes are very abundant in the arctic and subarctic, they bite viciously and they are of large size. Their seasonal peak of activity is in July when the sun shines 24 hours a day. In the great majority of places, because of the wide areas of swamps and wet ground, the ordinary methods of control such as drainage, clearing and oiling are not practicable. Only in more or less permanent bases could an attempt be made to institute these measures. Efforts must therefore be concentrated on personal protection. All the measures used in the jungles are applicable here except the chemical prophylaxis, since mosquitoes in the far north are only pests.

CHAPTER VI

FIRST AID

Definition. First aid includes the immediate, simple measures or precautions which are taken by a sick or injured person, or by others present, pending the arrival of a doctor. A little knowledge applied with judgment and common sense constitutes the best and most efficient first aid measure.

Purpose. The subject of first aid is of vital importance to the medical officer, to the enlisted men who assist him, and the troops they serve. The medical detachment of the infantry regiment consists of 126 men, all of whom must be adept in the rudiments of this subject in order that they may perform their missions effectively. Similarly, but to a lesser degree, officers and men of line units must be instructed in first aid so that in emergencies, in the absence of Medical Department personnel, constructive measures may be applied to save life or reduce the hazards of injury. This requirement poses a difficult task which falls to the medical officer. If he has well-instructed men about him as assistants, when the time comes that wounded men in large numbers arrive for medical care he will be able to attend more of them efficiently. He cannot perform his battle mission alone and unaided. Thus, unlike the civilian practitioner, the medical officer must assume the additional and more difficult task of training a large number of men in this subject.

The purpose of this chapter is to serve as a guide in this difficult training process. It is based upon Army experience, and the subjects discussed can be taught successfully to soldiers. The methods presented are practicable, but it is fully realized that there are others which may accomplish as good results. The medical officer will draw deeply upon his own knowledge, experience, and skill, adding other subjects which will be necessary to meet the unusual conditions which may be encountered.

It is not sufficient to select accurately the subjects and procedures to be taught. The instructor will fail unless he uses teaching methods appropriate to the personnel available to him. The soldier is a practical man. He does not aspire to become a doctor, nor will he absorb knowledge in the same manner or to the same degree as the student in medical school. Nevertheless, when taught by efficient methods, he can learn these things and learn them well. Each subject must be broken down into its essential elements, and each carefully explained in language, non-technical in nature, which the soldier can understand. A detailed demonstration of the subject explained must then be given to show the soldier exactly what is to be done. Thus he learns with his eyes as well as his ears. He is then ready to undertake practical application and perform the task which has been explained and demonstrated. Finally, since he may be responsible for human life pending the availability of a medical officer, he must be tested to insure that he is equipped with at least the minimum skill to justify entrusting him with the heavy responsibility he must bear.

All this forces the medical officer to plan his instructional task, secure the necessary equipment for demonstration and practical work, and be certain that he is otherwise adequately prepared. There will always be a shortage of time. He may anticipate a turnover of personnel with a constant influx of new men. He must conduct his training program while performing the routine task of caring for the normal numbers of sick and injured to be expected during periods of training. The reward which accrues to the medical officer who trains his men well is material in character. He will be able to perform more medical tasks; he will be able to do them better as he can free himself from many simple tasks; and, finally, he can do them more easily and quickly.

TRAINING IN FIRST AID SUBJECTS

One of the most important functions of the medical officer is the training of medical department enlisted men. In teaching first aid subjects, the group performance method of instruction is superior to other methods. It consists for four steps or phases, namely:

explanation, demonstration, imitation (application), and correction of errors. Proficiency is accomplished by repeated instruction and application.

A demonstration of the group performance method of instruction in the application of the Army Leg Splint serves as an excellent example:

ARMY HINGED HALF-RING THIGH AND LEG SPLINT

Text References. FM 8-50: (When revised) Splints, Appliances and Bandages. TM 8-220: (when revised) Medical Department Soldier's Handbook.

The application of the Army Hinged Half-Ring Thigh and Leg Splint should be preceded by instruction which has begun with elementary anatomy and physiology and has progressed through elementary medical aid. This should be followed by instruction in the various kinds of fractures, their diagnosis and complications with special reference to shock. The importance of early splinting, precautions regarding splints and a demonstration of standard types of splints should be covered in the unit



Plate 1. Demonstration Team for Application of the Army Hinged Half Ring Thigh and Leg Splint.

1. The operator, 2. The first assistant, 3. The second assistant, 4. The patient.

school. The instruction can then progress to the actual application of the Army Hinged Half-Ring Thigh and Leg Splint.

Troops Required. One officer, instructor in charge; one noncommissioned officer, assistant instructor; one demonstration team of 4 men for each group of 24 students or fraction thereof undergoing instruction. Each member of the demonstration team is placarded and designated as shown in Plate 1.

NOTE: The No. 4 man or "patient" in each demonstration team should wear an old pair of salvaged trousers which can be slit by the operator in the step "Dress Wound," so that the simulated wound (a spot on the anterior surface of the middle

third of the left thigh marked with mercurochrome or iodine previous to the demonstration) can be properly inspected and dressed. (Putting the dressing *over* the trousers might give the wrong impression of medical aid technique to newly-trained troops.)

Equipment Required. The equipment required for each demonstration team is as follows (See Plates 2 and 3):

- (1) One, litter, complete with slings, Item 78440 (or one of any other type of litter available).
- (2) Three, blanket, O.D. wool, 90 by 66 inches, Item 99090.
- (3) One, Splint, Army Leg, Half-ring, Hinged, Item 37500.
- (4) Two, Splint support and footrest, Item 37515.
- (5) One, Packet, first aid, instructional, Item 20310.



Plate 2. Equipment required for demonstration or application of the Army Leg Splint.

- (6) One, Bandage, muslin, 3 inch, Item 20080.
- (7) One, Splint strap adjustable, traction, Item 37455.
- (8) Six, Bandage, triangular, compressed, Item 92040.
- (9) Six, pin, safety, large, Item 78770.
- (10) One, Litter bar, complete. (Item Number not available.)

Instructional Aids. One large chart showing steps of application for the Army Hinged Half-Ring Thigh and Leg Splint (See Plate 4). Four oil cloth placards, numbered 1, 2, 3, 4, respectively, for each demonstration team used (See Plate 1).

NOTE: The salvaged trousers worn by the demonstration team "patient" and the mercurochrome or iodine spot painted on his left leg to simulate the wound are properly classed as "instructional aids."

Procedure. The group performance method of instruction is particularly useful in teaching certain basic and technical subjects. The number of students that can be instructed at one time is limited only by their ability to hear the instructor and see the demonstrators. A large number of students should always be divided into small groups, the number of groups depending upon the number of trained demonstrators

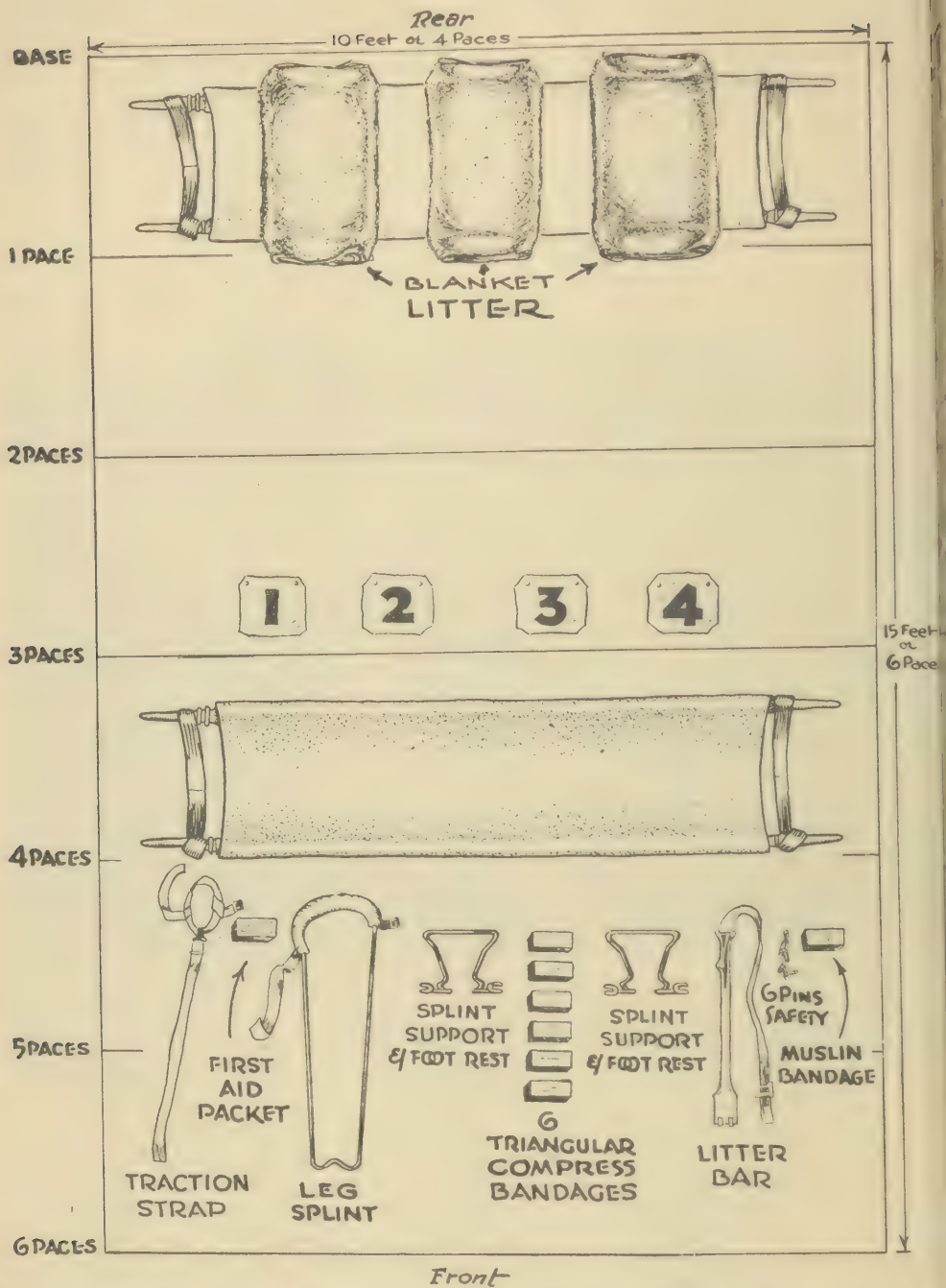


Plate 3. Diagram showing space and equipment required for each team of demonstrators or students. The positions of the team members and of the equipment at beginning of introduction to application, is indicated.

available. The smaller the individual group the more effective will be the training. If the individual groups be large and cannot clearly see the actions of the demonstrators, they should be permitted to leave their positions at the litter and form around the demonstrators in such a manner as will allow all to see equally well.

A very definite order is observed in using the group method of instruction. First, a procedure or operation is broken down into its logical steps. Then the instructor explains the first step (EXPLANATION). Secondly, the demonstration team demonstrates the first step (DEMONSTRATION). Third, the students imitate the first step (IMITATION). Fourth, the instructor and his assistants correct the errors, if any, made by the students in imitating the first step (CORRECTION OF ERRORS). The instructor then explains the second step and the demonstration team demonstrates it, etc. Each of the steps of the operation is handled consecutively and similarly by the four

ARMY LEG SPLINT 10 STEPS

- 1. DRESS LITTER**
- 2. APPLY TRACTION STRAP**
INITIATE TRACTION
- 3. DRESS WOUND**
- 4. APPLY SPLINT**
SECURE TRACTION
- 5. SPLINT SUPPORT**
- 6. SUPPORT LEG**
- 7. FOOT REST**
- 8. PLACE PATIENT ON LITTER**
- 9. FIX SPLINT WITH LITTER BAR**
- 10. COVER PATIENT**

Plate 4. Chart showing steps in application of Army Hinged Half-Ring Thigh and Leg Splint.

phases of the group method: (1) EXPLANATION, (2) DEMONSTRATION, (3) IMITATION, and (4) CORRECTION OF ERRORS, until the entire operation has been completed.

Before the arrival of the group to be instructed the required number of litters, blankets and sets of equipment should be opened and arranged as shown in Plate 5. The equip-

ment listed on page 514 is placed in proper position for the demonstration team and for each team of students (See Plate 3).

The demonstration team marches to its litter at the head of the group of litters. They check their equipment.

The demonstration team is formed for instruction as per Plate 1. The men are numbered 1, 2, 3, 4, from right to left.

The officer instructor in charge directs the formation of the class. The students are assigned to their positions, 4 students to each litter.

The students in groups of four take their positions at their respective litters facing the demonstration team. The instructor has the demonstration team count off after which the student teams count off. The student teams check their respective equipment.

(In subsequent periods of instruction, the students should be rotated through the four numbered positions).

Introduction to Step-by-Step Application of Army Leg Splint. The officer instructor introduces the period of instruction by explaining that the subject is the application of the Army Hinged Half-Ring Thigh and Leg Splint. He enumerates its uses and explains that, for instructional purposes only, the entire operation has been broken down into simple steps and that on the battlefield the splint would be applied without any perceptible adherence to a strict step-by-step technique, although the general sequence of actions would be essentially the same. He explains the way in which the step-by-step method works and he instructs the students to stand at parade rest while he explains each step. He states that he will then call the demonstrators to attention and order them to proceed, at which time they will demonstrate the step. He will then call the class to attention and order them to proceed with the imitation (application); each student of each team doing the respective job assigned to him in the explanation of the step. When finished with a step, each student will return to his former position and stand at parade rest, unless ordered otherwise. At this point the instructor and his assistant will correct any errors.

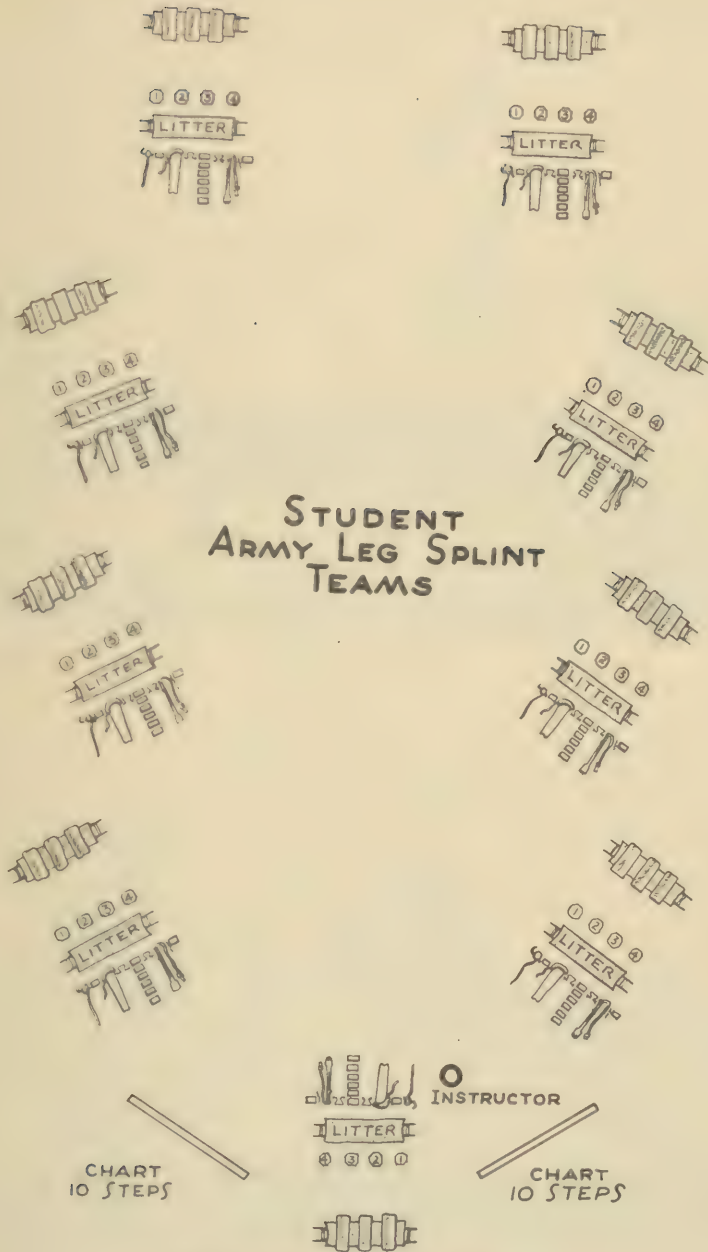
He sets the stage for the ensuing action by explaining that the ideal treatment for fractures of the thigh and leg is to "Splint them where they lie." This, however, is not always practicable and the Army Leg Splint is usually not applied in areas forward of the battalion aid station. In transporting the patient to the aid station the two legs may be tied together to aid in the immobilization of the fracture.

At this time the instructor explains that the "patient" is assumed to have suffered a compound fracture of the middle third of the left femur and has been brought to the aid station on the undressed litter. He instructs the number four man of each team to lie on his back on the litter in front of his team with his feet toward the number one man. The "patient's" left trouser leg is slit at the seam so that the thigh is exposed, making visible the mercurochrome or iodine mark previously placed there to simulate the flesh wound.

The instructor then proceeds with the application of the Army Leg Splint, using the following 10 steps (See Plate 4, Chart):

- (1) Dress litter.
- (2) Apply Traction Strap; initiate traction.
- (3) Dress wound.
- (4) Apply splint; secure traction strap.
- (5) Splint support.
- (6) Support leg.
- (7) Foot rest.
- (8) Place patient on dressed litter.
- (9) Fix splint with litter bar.
- (10) Cover patient.

Step No. 1: Dress Litter (See Plate 6). The litter is dressed by the No. 2 and No. 3 men. No. 1 steps to the right so that students' vision is not blocked. A litter is said to be "dressed" when the blankets have been arranged on it as follows: The first blanket is placed on the litter lengthwise so that one edge corresponds with the outer



DEMONSTRATION TEAM

Plate 5. Suggested arrangement for group performance method of instruction.

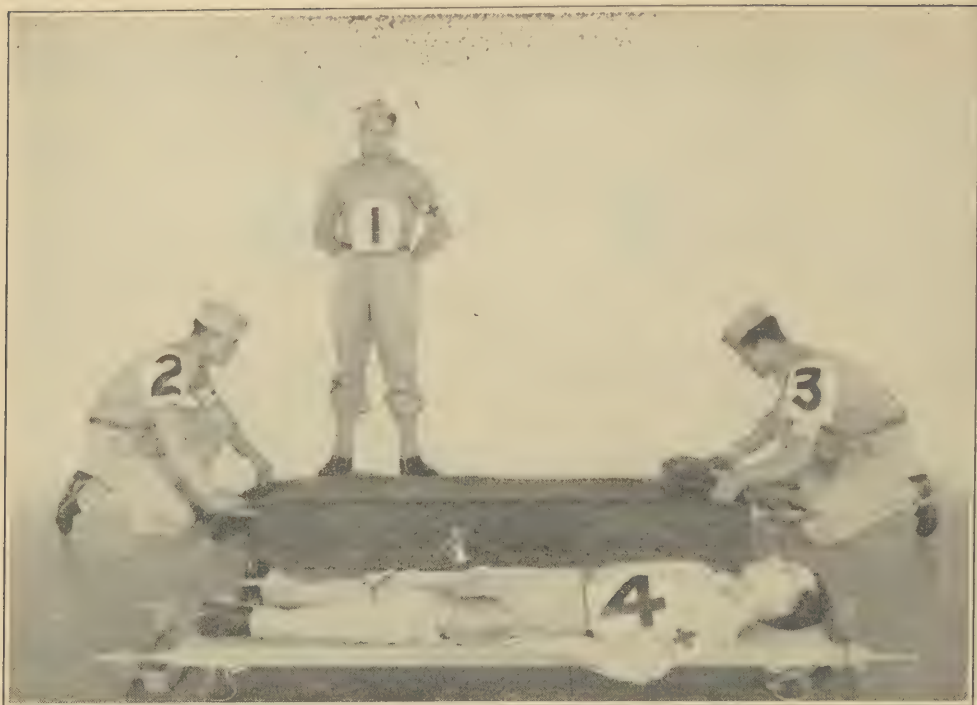


Plate 6. Step No. 1, Dress Litter. Numbers 2 and 3 Completing the Dressing of the Litter.



Plate 7. Step No. 2: Part I, Showing traction strap in place.

(or far) pole of the litter and its upper edge is even with the head of the canvas. The second blanket is placed lengthwise on the first so that one edge corresponds with the inner pole of the litter and its upper edge is again even with the head end of the canvas. It is then folded back upon itself once in the same manner as the first blanket. The free edges of each of these blankets hang over opposite sides of the litter and there should be four thicknesses of blankets on the litter. The third blanket is folded to form a pillow for the patient, if the latter is not in shock, and is used as a pillow until the last step.

Step No. 2: Apply Traction Strap. Initiate Traction (See Plates 7, 8, and 9). The instructor, holding up a traction strap, identifies its parts: (1) The loop, (2) the retention strap and buckle, (3) the extension strap and swivel. The No. 2 man then applies the adjustable traction strap to the foot of the injured limb without moving the foot and without removing the shoe. The loop is slipped over the toes and the forward half of the foot and placed around the foot, encircling it at the instep in such a manner as to bring the buckle to rest just posterior to the external malleolus. The retention strap is passed back of the ankle from the medial side to the lateral side and secured in the buckle. The swivel with the long traction strap attached is slid on the loop until it rests under the middle of the instep of the shoe.

The instructor holds up the Army Hinged Half-Ring Thigh and Leg Splint and identifies the following parts: (1) The short inner rod, the long outer rod and the notched distal end; (2) The half-ring and the hinges; (3) The anterior web strap and its buckle. The No. 1 man takes the Army Leg Splint and adjusts it, placing the



Plate 8. Step No. 2: Part II, Placing right hand through splint.

half-ring at a right angle to the bars of the splint so that when applied the short bar of the splint will be on the inner side of the leg and the concavity of the ring will be directed upward. In order to effect this, he places the splint next to the litter alongside the injured leg, with the ring at the proximal end of the thigh, the shorter rod down, and the concavity of the ring directed toward the injured leg. The No. 2



Plate 9. Step No. 2: Part II, Traction Initiated.

man then initiates traction as follows: Having applied the traction strap to the foot of the injured leg, he kneels at the feet of the patient, facing the patient, and the No. 3 man kneels at the side of the patient. The No. 2 man then places his right hand between the rods of the leg splint and grasps the heel. He grasps the toe with the left hand and, keeping his arms straight at the elbows, exerts a steady pull to produce the necessary traction. This manual traction must be continued until the traction strap has been secured to the end of the leg splint (STEP NO. 4). The No. 3 man slides his hands under the calf and thigh of the injured leg to support it until the supporting bandages have been applied in Step No. 6.



Plate 10. Step No. 3: Dressing the Wound.

Step No. 3: Dress Wound (See Plate 10). The instructor, holding up a First Aid Packet, instructional type, identifies it as the dressing which will be used in this step.

While the No. 2 man continues manual traction and the No. 3 man supports the injured leg, the No. 1 man inspects the wound of the left thigh and applies an occlusive sterile dressing. No. 2 and No. 3 man cautiously raise the injured leg



Plate 11. Step No. 4: Rolling the Army Leg Splint into Position.

high enough to allow the No. 1 man to apply the dressing and to inspect and dress any wound on the under surface of the leg. (The instructor explains that the trousers of the "Patients" in the student group will not be cut, but that for the purpose of saving time the dressing will be applied over the "Patients" trousers. He cautions that this should *never* be done in actual practice).



Plate 12. Step No. 4: Securing the Splint in Place with the Interior Web Strap.

Step No. 4: Apply Splint and Secure Traction Strap (See Plates 11, 12, and 13).

While traction is maintained by No. 2 and the leg and thigh are supported by No. 3, the No. 1 man applies the Army Leg Splint to the injured leg by rolling it under the leg and thigh from without inward, the short rod to the inner side. The half-ring, with the concavity directed upward is pushed firmly against the tuberosity of the ischium in order to effect counter-traction. The operator is careful to avoid

possible injury to the patient's scrotum and testicles from pressure by the splint. When the splint is correctly placed, the No. 1 man secures it by buckling the anterior web strap.

Fixed traction is then effected in the following manner: No. 1 grasps the free end of the long traction strap, brings it down over the notched distal end of the



Plate 13. Step No. 4: Securing Traction Strap.

splint, then folds it back upon itself and inserts it through the metal ring of the swivel. He then pulls on the free end of the strap until the required traction is obtained and secures it to the notched distal end of the splint with an ordinary cinch knot.



Plate 14. Step No. 5: Securing the Splint Support.

Step No. 5: Splint Support (See Plate 14). The instructor, holding up a **SPLINT SUPPORT**, explains that it is identical with the **FOOT REST** which will be used later and identifies its parts: (1) The base (or closed end), (2) the splint end (or open end), (3) the arms.

No. 1 fastens the splint support to the side rods of the Army Leg Splint with the arms of the support directed toward the patient and the base on the litter. This relieves the No. 2 man, enabling him to assist in the next step. No. 3 continues to support the leg and thigh.

Step No. 6: Support Leg (See Plate 15). The instructor explains that the supports



Plate 15. Step No. 6: Supporting the Leg.



Plate 16. Step No. 7: Securing Foot to the Foot Rest.

are BANDAGES, Triangular, compressed—not the heavy triangular bandage with tape ties used as arm slings. He *unrolls* one and mentions that they are *not* to be unfolded. He also mentions that they are used instead of ordinary muslin bandages because they do not roll forming a narrow, constricting, uncomfortable cord.

No. 1 and No. 2 arrange 5 compressed triangular bandages, unrolled but not unfolded, on the splint to form a cradle for the leg—two under the thigh, one under the knee, and two under the leg. These are all applied in like fashion, as follows:

The bandage is placed over the bars of the splint and under the leg. The ends of the bandage are reversed, by crossing them under the splint, and are then brought up and over the bars of the splint and tied together over the outer bar. No. 3 is then free to assist further in the succeeding steps of the application of the leg splint. (The instructor here remarks that the leg must be supported in every case in this way, regardless of the location of the fracture; muslin bandages 5 inches wide may be used in place of compressed triangular bandages, if the latter are not available; the wound dressing should not be incorporated in any of the leg supports).



Plate 17. Step No. 8: Lifting Patient.

Step No. 7: Foot Rest (See Plate 16). No. 1, assisted by No. 2 then attaches the foot rest to the rods of the splint just below the foot, with the base (or closed end) of the support directed anteriorly and the arms directed away from the patient. The foot rest is pushed up against the foot until the foot is at right angles to the leg. The foot is then secured to the foot rest by means of a triangular bandage in order to support and fix the foot in its proper position and to prevent foot drop.

Step No. 8: Place Patient on Dressed Litter (See Plates 17, 18, and 19). No. 2 and No. 3 take their positions alongside the patient on the side of the injured leg. No. 2 toward the head of the patient, No. 3 toward the feet. No. 1 assists from the opposite (uninjured) side. All three men kneel on that knee which is nearer the patient's feet. No. 3 passes both forearms under the patient's legs, carefully supporting the splinted leg. No. 2 passes one hand under the patient's hips and thighs, and the other hand



Plate 18. Step No. 8: Placing Dressed Litter Under Patient.



Plate 19. Step No. 8: Patient on Dressed Litter.

under the patient's shoulders. All lift together, slowly and carefully, and place the patient upon the knees of the No. 2 and No. 3 men. As soon as he is firmly supported there, the No. 1 man relinquishes his hold and removes the undressed litter. Exposing the lower 5 inches of canvas, he slides the dressed litter underneath the patient. No. 1 resumes his former kneeling position opposite No. 2 and No. 3 and prepares to assist in lowering the patient. The patient is now gently lowered upon the dressed litter in such a way that the base of the splint support rests upon the canvas of the litter about $1\frac{1}{2}$ inches from its lower edge.

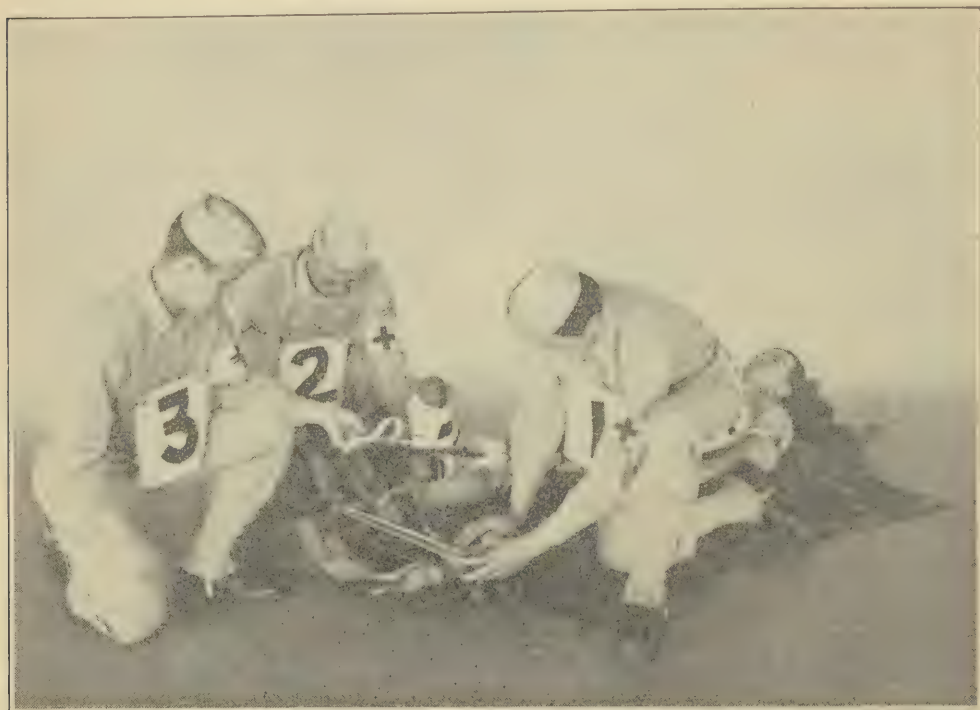


Plate 20. Step No. 9: Securing Litter Bar in Place.

Step No. 9: Fix Splint With Litter Bar (See Plates 20 and 21). The instructor holds up the litter bar and identifies its parts: (1) smooth under surface, (2) grooved upper surface, (3) cam end, (4) cam lock, (5) securing strap, and (6) buckle with buckle catch. He then demonstrates how the buckle attaches to the buckle end of the bar and how it is locked in place by the buckle catch.

No. 3 holds up distal end of splint so that base of splint support is about 3 inches off the canvas of the litter. No. 2 passes litter bar under the litter to No. 1 man who places litter bar across lower end of litter resting on both poles. The grooved surface is directed upward and its cam end is on the side of the injured leg and allows the base of the splint support to rest easily in the groove. The cam lock handle will be on the side of the bar *toward* the patient when the left leg is splinted and on the side away from the patient when the right leg is splinted. At this point the bar may be straight across the litter, at right angles to the long axis of the litter or slightly angulated. Regardless of whether the bar is straight across the litter or angulated, No. 2 then secures the bar tightly to the litter by fastening the buckle to the litter bar (see Plate 20). No. 2 locks the buckle in place by hooking the catch on its under surface over the side of the litter bar. The buckle should be so adjusted on the securing strap that when buckled the securing strap is under considerable tension, sufficient to prevent any movement of the bar on the litter. Finally, No. 1



Plate 21. Step No. 9: Locking Splint Support in Litter Bar.



Plate 22. Step No. 10: Placing Third Blanket Over Patient.

fastens the cam lock, thus fixing the base of the splint support securely in the groove of the litter bar.

Step No. 10: Cover Patient (See Plates 22 and 23). Nos. 2 and 3 fold the third blanket once lengthwise and place it over the patient, the upper edge under the patient's chin. The free edges of the first two blankets are folded over the third and secured in place, using three safety pins to the body portion and three safety pins to the portion of the blankets enclosing the patient's feet and the lower end of the splint. This gives four thicknesses of blankets over and four under the patient, thus assisting in the prevention of shock by conserving the patient's body heat.



Plate 23. Step No. 10: Step Completed. Patient Ready for Transportation.

STANDARD RULES OF FIRST AID

In order to insure and increase efficiency there are several principles and rules to be observed in the administration of first aid:

Keep cool: a life may depend on your ability to keep calm and not get excited. It will help you to employ the most rational treatment.

Examine the patient gently, being careful to avoid touching a wound with anything unclean, such as dirty fingers, dirty clothes, or dirty water.

Check hemorrhage quickly either by compression or tourniquet. Use the cleanest materials available to avoid infection. Make application at the site which will stop hemorrhage and cause least damage.

Send for a doctor or ambulance if necessary. Do not try to do too much, but make the patient comfortable and keep him quiet until the doctor arrives.

Keep the crowd back: enlist the aid of a willing assistant to do this while you render first aid. Then act quickly but quietly, being systematic in your examination and treatment.

Loosen clothing and keep patient warm. Most emergencies will indicate the increase of heat, rather than the application of cold.

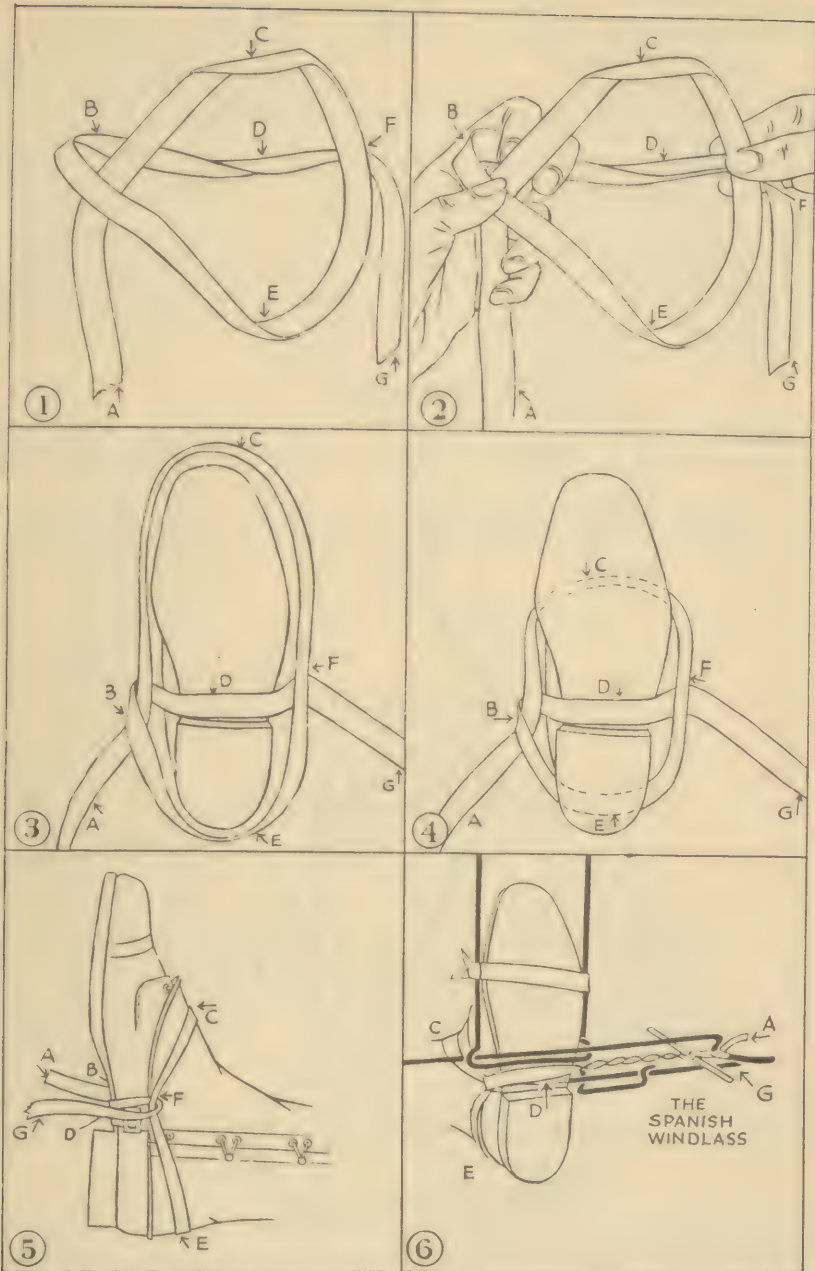


Fig. 1. Muslin Bandage.

Fig. 3. Applying Hitch to the Foot.

Fig. 5. Side View, Ankle Hitch in Position.

Fig. 2. How to Hold Muslin Bandage.

Fig. 4. Adjusting Hitch into Position.

Fig. 6. Spanish Windlass.

Plate 24. The Ankle Hitch and Spanish Windlass. Substitute for Step No. 2.

A piece of muslin bandage about one yard long is held in the left hand, one-third falling to the left. Pick up the long end with the right hand and form a loop. Drop the long end over the loop as if to tie a single knot but do not bring it through the loop. The hitch is now ready to apply to the foot. Hold the hitch with the left hand at the point marked "B" and with the right hand at the point marked "F". Place that part of the loop marked "C" over the foot at the point marked "C" in the diagram. (Plate 24, Fig. 4.) That part of the loop marked "D" under the instep and that part of the loop marked "E" is placed back of the heel at the point marked "E". Draw the hitch into position and apply the Spanish windlass.

Splint fracture cases where they lie, using the most satisfactory means of splinting. If the fracture is compound, bandage with sterile material before splinting.

Do not give anything by mouth if there is injury to the abdomen. Alcoholic stimulants are not ordinarily advocated. The use of these may incriminate the injured if the accident is investigated by military or civil authorities. In most cases where indicated at all, the use of water, hot coffee, or similar liquids is beneficial.

Relieve pain wherever possible. Place the patient in the most comfortable position and if his condition will permit, remove him carefully to a clean, quiet area away from curious spectators.

Treat the patient primarily, giving him the advantage of the best knowledge you have. His general condition initially may not tolerate much physical treatment. Remember that shock is a very serious condition, and careful handling may save life. Avoid transportation immediately if the wounded will suffer more shock or injury incident thereto. This is particularly true of fracture cases or back injuries.

BANDAGING

The application of bandages is an art which, like all other arts, improves with experience and the interest and skill of the operator. It is used in first aid, orthopedics, and surgery.

Purpose. Bandages are used for the following purposes:

To apply pressure to various parts of the body in order to control bleeding.



Plate 25. Triangular Bandage Used as a Sling.

To hold surgical dressings, medicinal applications, or splints in place.

To hold or immobilize a part in order to afford support and protection, as in the case of injured limbs. In so doing they may also be used to correct a deformity.

To promote the absorption of fluids or exudates.

To support weakened blood vessel walls and to prevent edema and swelling.

To protect open wounds from infection.

Bandages may be made of various materials, the most common being gauze, zinc oxide adhesive plaster, muslin, crinoline powdered with plaster of Paris, rubber, absorbent cotton, felt, and elastic webbing. Careful selection should be made of the proper material for bandaging.

The types of bandages are selected for the purpose for which they are to be used. The most common of these types with a brief discussion of their uses are:

The triangular bandage. (See Plate 25.) Used as a sling to support the arm or hand, or to hold dressings in place on the shoulder, hand, foot, hip, or buttocks. Substitutes for the triangular bandage are the handkerchief bandage, the tailed bandages, T-binders, and the cravat.



Plate 26. Bandages for Head and Arm.

The roller bandage is most commonly used. It may be prepared or purchased in sizes varying from $\frac{1}{2}$ to 12 inches in width and 1 yard up in length. The size of the bandage should vary according to the part of the body being bandaged. Roller bandage is used especially on the head and limbs. (See Plate 26.)

Adhesive plaster (Zinc oxide tape) is considered a type of bandage since it is used to retain many types of dressings in place by virtue of its adhesive qualities. It is prepared as a roller bandage and is used as such. The mole-skin adhesive is used, especially in traction for fracture cases, because it is stronger and does not lose its elasticity when subjected to tension for a long period of time.

Army First Aid Dressings. The shell wound dressing, which is a larger dressing used in the field, is supplied to the personnel of the Medical Department. This type of dress-

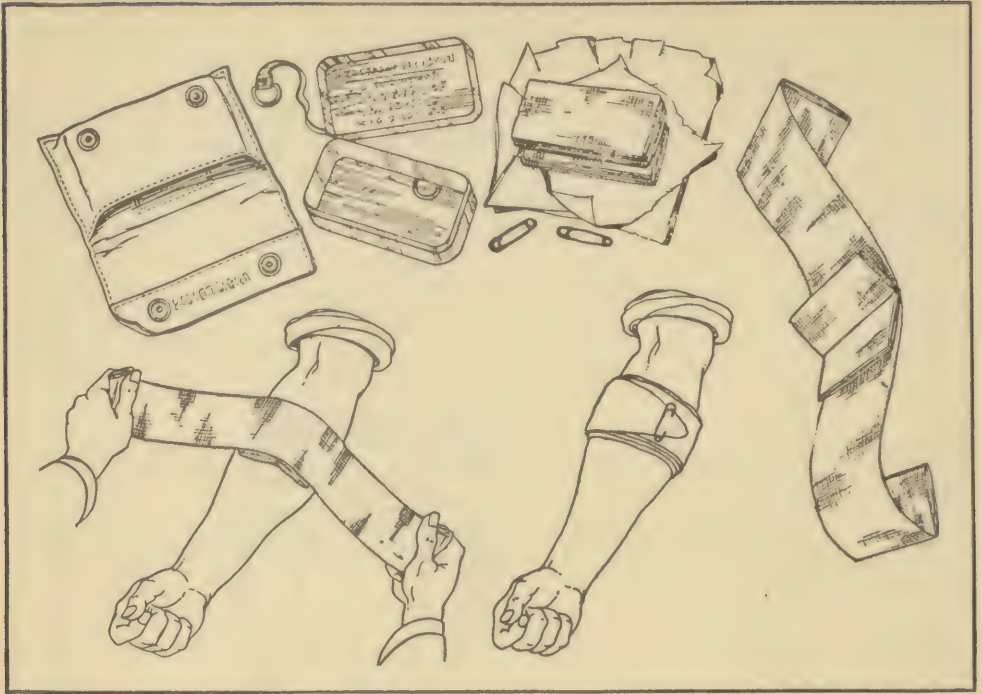


Plate 27. First Aid Packet (Old Style).

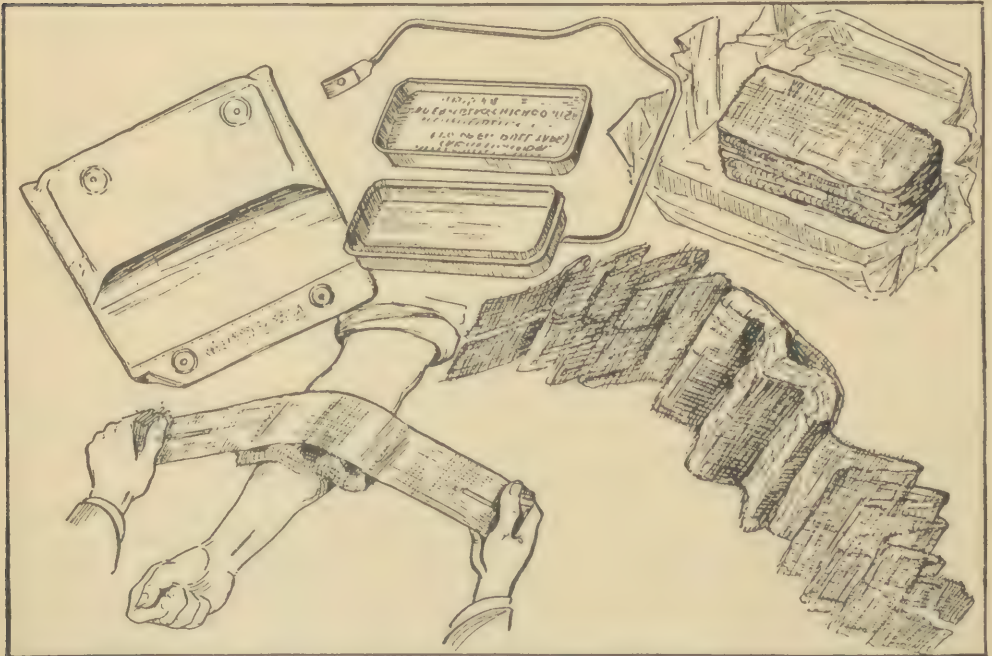


Plate 28. First Aid Packet (New Style).

ing consists of compresses made from a yard of sterile gauze, folded to measure 6 by 9 inches and with attached bandage 3 inches wide by 48 inches long. In addition, there is one bandage 3 inches wide by 5 yards long, and two safety pins. The whole is wrapped in waxed paper and is known as the "shell wound dressing." This dressing is comparable in its use to a large abdominal pad, and it can be used for this purpose.

The individual first aid packet is included in the field equipment of every officer and soldier in the military service. It is carried in a separate, small web pouch attached to the pistol or cartridge belt of the officer or soldier. At present there are two types of first aid packets for issue, commonly known as the "old" and the "new." The differences between them will be briefly described. Eventually all will be of the new type.

The *old type packet* contains two sterile dressings, each wrapped in waxed paper ready to apply to a wound, and two safety pins. A printed set of instructions is enclosed in each packet. Each dressing consists of a pad or compress of gauze, folded to $3\frac{1}{2}$ by 7 inches, which is securely sewed to the middle of a gauze bandage which is 4 by 84 inches. (See Plate 27.) The pad of gauze is folded in such a way that it can be readily opened to a larger size by breaking a single retaining thread. These two dressings and the safety pins are enclosed in a sealed metal container 1 by $2\frac{1}{2}$ by 4 inches which is opened by pulling on the metal ring attached to the sealing strip. When the packet is inserted in its carrying pouch the ring should be "down" (at the bottom of the pouch) so that when the packet is pulled out for inspection it will not be accidentally opened. A piece of blue paper on each dressing indicates the side to be kept away from the wound.

The *new type packet* contains a single sterile dressing wrapped in waxed paper. No safety pins or instructions are provided. The dressing consists of a pad of cotton and gauze, folded to 4 by 7 inches. The metal container has a sealing device different from the old type which makes it easier to open and also makes it less likely to be accidentally opened. (See Plate 28.) The container is about the same size as the one for the old style packet.

Rules for Bandaging. Rules for bandaging are the result of experience and will assist in securing comfort, durability, and neatness. In addition, there will be greater ease in application, economy in time and materials, and a neat completed appearance.

Place the patient in a comfortable position. Place the injured part in the position in which it should remain after the application of the bandage.

Before applying a bandage to any part, see that the part is clean.

Place cotton or other suitable dressing between opposing skin surfaces, i.e., between the fingers and toes, behind the ears, between the arms and body. The same principle is applicable where bandages or a cast may cause irritation from pressure.

Bandage from the extremity of the limb and work toward the trunk.

Hold the bandage firmly and avoid dropping it. Never allow the bandage to unwind excessively; use it gradually as needed, keeping the roll part uppermost.

Secure the bandage firmly by making at least two turns around the part, fixing the bandage by the second turn.

Bandage evenly and smoothly, neither too loosely nor too tightly. If too loose the bandage will not be retained, and if too tight the circulation of the part may be impeded. Check the tip of the limb for color and warmth to make certain that the circulation is not reduced. Caution must be used over inflamed or painful areas. Children tolerate less pressure than adults. Be careful around the flexed portions of the limbs where the blood vessels are near the surface.

Avoid the use of excess bandage. Extra turns increase pressure as well as heat and discomfort.

Secure a finished appearance by even overlapping and by placing the crosses and reverses in a straight line. Secure the last turn by tying or with a safety pin, or anchor with a clean piece of adhesive tape.

The use of the first aid packet should be well understood by each officer and soldier. Always use the first aid packet belonging to the injured soldier. Carefully remove the paper cover from the dressing without unfolding the bandage or the pad and hold

by grasping the outside rolls of bandage between the thumb and fingers of each hand, the back of the dressing toward you. The back of the dressing is marked by a piece of colored paper. Open the pad by pulling on the two rolls of bandage and apply the inner surface of the pad to the wound, still holding one roll of bandage in each hand. (See Plates 27 and 28.) Then wrap the bandages around the injured member and over the pad in order to prevent the dressing from slipping. Tie the ends of the bandage together or fasten with a safety pin. A second dressing if necessary may be applied over or next to the first. A head dressing is more difficult to apply than one on an arm or leg. Head bandages are kept from slipping by passing turns under the chin, behind the ears, over the crown, and by the use of safety pins.

WOUNDS

A wound is a breach of the skin or the flesh, or both, usually caused by external violence. The type of wound depends upon the shape and size of the injuring element. It may be described as a break in the continuity of any of the tissues of the body, but the term is commonly limited to the injuries of the skin, mucous membrane, and other soft tissues.

Types of Wounds and Their Treatment. The types of wounds with respective treatment for each are as follows:

Incised wounds bleed freely, the amount of bleeding depending on the region injured and the size and number of blood vessels cut. The margins of wounds of this type usually separate widely. They should be treated by checking hemorrhage (see under hemorrhage), the removal of any foreign body, sterilization of the wound (iodine), and occluding of the margins. This latter may be accomplished by drawing the edges together by a firm bandage, by adhesive tape strips or by sutures if these are available. In extensive wounds the part should be put at rest by slings or splints.

Lacerated or contused wounds are caused by blunt instruments and large heavy objects. The hemorrhage is usually slight since the vessels are torn irregularly. Sometimes the vessels are torn from their sheaths and may be seen pulsating on the surface. The injury is frequently so extensive as to cause the death of large areas of tissue. Shock is apt to be severe. These wounds must always be regarded as infected and therefore should never be closed. They should be packed open with sterilized gauze and antiseptics, the hemorrhage controlled, the associated shock treated, and the part put at rest. Exposed vessels should be caught and ligated as they may open and bleed at any time.

Punctured wounds are caused by penetrating instruments, from a pin to a bayonet or pick axe. The external opening may be small while internal injury, to arteries, nerves, and organs, may be severe. This type of wound is frequently infected since the drainage is not good. The treatment follows that already outlined for lacerated wounds.

Gunshot wounds vary with the character of the projectile. Military rifle and machine gun bullets have a very high velocity and tremendous striking power. At ranges under 500 yards, the effects on the soft tissues are frequently explosive. At longer ranges the wounds of entrance and exit may be drilled so clean as to be hardly noticeable and if escaping vital structures, very little damage may result. Shrapnel wounds are caused by lead shrapnel balls about the size of marbles. They are not ragged or sharp and are not as apt to carry portions of clothing deep into the wounds as high explosive. The severest forms of wound infections usually result from the introduction of dirty clothing into the tissues. High explosive wounds are particularly destructive. The shell particles are jagged and sharp and may do extensive damage after entering the body. The wound of entrance is usually small, much smaller than it would seem possible for the fragment to enter. The destruction of the deeper tissues may be very marked, and these wounds are usually infected. Pistol wounds are somewhat similar to shrapnel wounds.

The first aid treatment follows that given for other types of wounds, viz, application of the first aid dressings, control of hemorrhage, splinting the part, and combating shock.

In gunshot wounds of the joints the extremity should be splinted. Emergency operation may be required later to remove foreign bodies in the joint cavities. Wounds of the abdomen usually require early operation. Such cases should be given emergency treatment, receive nothing by mouth, and be moved promptly to the nearest hospital.

Extensive wounds of the chest are very serious. It is important to fill the defect in the chest wall at once with ample dressings and packs. Unless the lung is promptly compressed and immobilized, death may rapidly supervene from changes in intrathoracic pressure and mediastinal flutter with the production of paradoxical or pendulum breathing. When the chest cavity is opened by a wound, air rushes in and destroys the intrapleural negative pressure on that side. When respiration is attempted the negative pressure in the uninjured side sucks the mediastinum toward that side and air rushes in through the wound in the chest wall of the injured side. As a consequence the uninjured lung is compressed and is unable to get enough air through the trachea and bronchial tubes. When expiration occurs the reverse takes place. The force of expiration is not expended in squeezing air out of the normal lung because it is lost by the shifting of the mediastinum into the injured side forcing air out of the wound. Instead of a firm bony cage we have a box, one side of which is flexible (the mediastinum), which shifts back and forth like a pendulum (hence pendulum breathing). Consequently air can neither get in or out of the normal lung in sufficient quantity, and the injured person dies of asphyxia or heart failure from the violent motions of the mediastinum. The rule in gaping wounds of the chest is: *Plug the defect in the chest wall at once with whatever comes to hand.* Never mind sterility if no sterile supplies are available—use the man's shirt if nothing else is handy. But whatever you do fill the gaping chest wound at once.

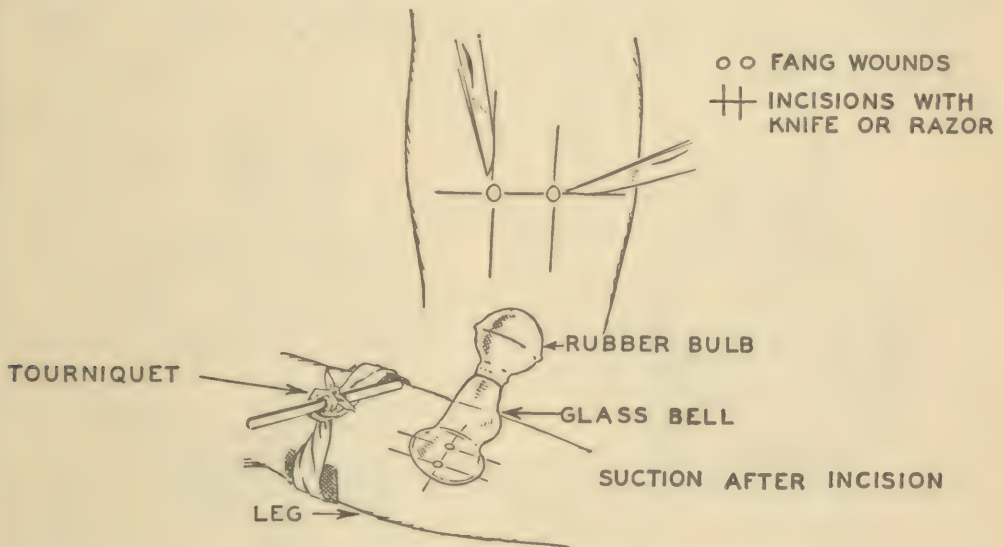


Plate 29. Treatment of Snake Bite.

Poisoned or infected wounds result from the stings of insects, the bites of snakes, wounds of poisoned darts or arrows, the bite of a rabid dog, or most commonly, infection from micro-organisms.

Infected wounds seldom require first aid treatment except in unusual circumstances (isolated camps, exploring trips, etc.). In such instances the infected area should be opened widely and drained. Whenever there is any indication of infection of the skin, which is manifested by redness, inflammation, and tenderness on pressure upon the area involved, the application of a saturated solution of hot magnesium sulphate (Epsom salts) by means of soaking or the use of packs is recommended. This is the safest therapy and in most instances the best type of therapy for pyogenic infections. If the

injury is on a leg or arm, immerse or pack the entire limb to include the thigh or upper arm. If Epsom salts is not available, use boric acid or ordinary table salt in saturated solutions.

Snake bite is a comparatively rare accident but requires prompt attention when it occurs, since the venom is very rapidly absorbed into the system. Apply a tourniquet close to the wound, on the side toward the heart. With a knife or razor blade, make a (H) cut through the fang marks (fang wounds), as shown in Plate 29 so that the wound will bleed freely.

If a suction apparatus is available suck out the wound with it. Otherwise suck the wound strongly and spit out the blood and poison; there is little danger in this to the person doing it unless he has cracks, sores, or cuts on the lips or in the mouth. Alcoholic liquors are not only useless but actually are harmful in the treatment of snake bite.

The bites of scorpions, poisonous spiders, and other poisonous insects are treated in the same manner as are snake bites. Other insect bites may be painful but generally are not dangerous. Local applications of baking soda or ammonia may be helpful in controlling pain and swelling.

Dog bites may be dangerous. A person bitten by a mad dog or other rabid animal should be sent at once to a doctor for treatment. The rabid animal should not be killed at once but should be impounded and turned over to a veterinarian for observation and disposition. If unable to secure the services of a medical officer immediately, the following treatment is suggested: Careful, patient, and prolonged cleansing of the wound with water and soap and subsequent irrigation of the wound with warm salt solution. If the wound is so irregular or deep that all parts of the wound cannot be reached, the wound will have to be enlarged sufficiently to permit thorough cleansing. The regular Pasteur treatment is advised as a safety factor to combat any possibility of virus entering the deeper tissues. It should definitely be used where cleansing treatment has been delayed or inadequate.

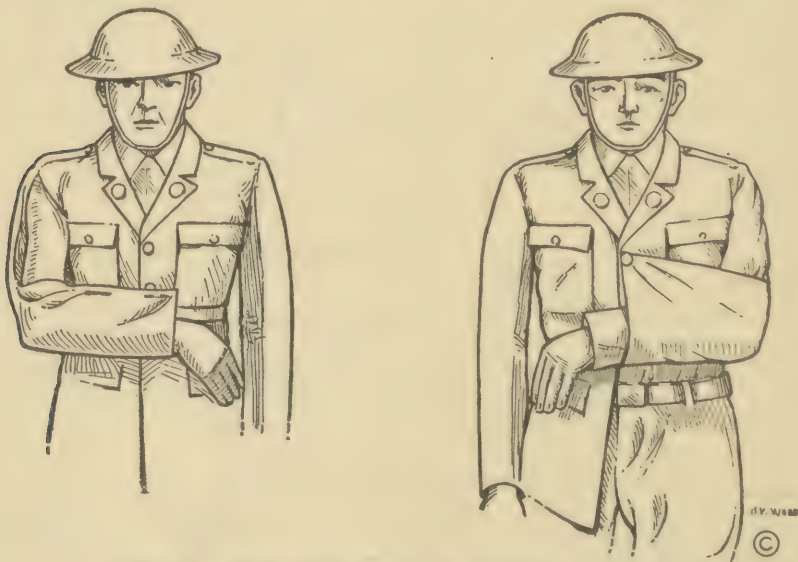


Plate 30. Improvised Slings for Injuries of the Arm.

Rules for First Aid Treatment of Wounds. Each type of wound may need some specific individual treatment, but there are some general rules which will aid in giving proper first aid treatment to accidental wounds:

Never touch the wound with anything unclean—dirty hands, non-sterile bandages, or anything dirty as severe infection may result.

Do not wash a wound with unsterile water. The wound is apt to be deeply infected by

such attempts at cleansing. Treat the wound with iodine or other antiseptic. Use only one kind of antiseptic.

Expose the wound by cutting away the clothing if necessary. Avoid contaminating the wound with soiled clothes.

Apply a first aid dressing, and bandage firmly to control bleeding.

Support the injured part—A sling for the arm using the coat or shirt sleeve (Plate 30), a splint for the leg—if the wound is large.

Patients with contaminated wounds should receive antitetanic serum or tetanus toxoid at the earliest opportunity (Battalion aid station.) Look at the soldier's identification tag to see when he had his last dose of tetanus toxoid. Before giving antitetanic serum inquire from the patient if he has ever been treated previously with any injection which included horse serum. If so, his treatment should be administered under the close supervision of a medical officer.

HEMORRHAGE

Hemorrhage, or bleeding, is the escaping of blood from the circulatory system such as occurs when a blood vessel is severed in a wound. The blood is a circulating fluid used as a vehicle to carry nourishment to and remove wastes from all parts of the body. It is contained in a closed system of blood vessels, the arteries, capillaries, and veins, and is carried through the circulatory system by the pumping action of the heart. To accomplish its physiological function, the circulating fluid is maintained at a slight pressure. If a large blood vessel is cut, especially a large artery, only the quickest and most accurate measures will prevent the injured person from bleeding to death in a few minutes.

Types of Hemorrhage. Blood flowing from a cut artery comes out in jets or spurts and is bright red in color. This is *arterial* hemorrhage. The apparent color of the escaping blood is relatively unimportant as it is often mixed with the darker venous blood escaping from veins which were cut at the same time as the artery. The spurting is important and is unmistakable. Blood flowing from a cut vein comes out in a steady, comparatively slow stream. This is *venous* hemorrhage. Venous blood is darker in color than arterial blood. If only capillaries or small veins are cut the blood flows slowly or appears to ooze out.

Severity of Hemorrhage. While severity of bleeding cannot be accurately classified, the following is a very rough method for estimating the gravity of a given case of bleeding or hemorrhage:

If the *blood drips* from the wound the loss of blood is not likely to be serious, and the bleeding will probably stop very soon of its own accord.

If the *blood flows from the wound in a small, steady stream*, up to about twice the diameter of the lead in an ordinary pencil, or if spurting in a very small stream, the loss of blood should be looked upon with some concern but not with alarm. The bleeding will probably stop soon of its own accord or promptly upon the application of a dressing to the wound.

If the *blood flows from the wound in a large stream* (larger than that indicated above) or spurts in more than a very small stream, the loss of blood should be looked upon with considerable concern. Steady pressure to the wound or the more active and more elaborate measures for the arrest of hemorrhage will have to be used.

If the *blood flows or spurts in a relatively thick large stream* the situation is very serious and must be dealt with promptly and vigorously, including hand or tourniquet pressure over the main arterial trunk supplying the affected part.

Some parts of the body are more richly supplied with blood vessels than other parts; the head and face, the hands, and the feet are examples. (See Plate 31.) Even slight wounds affecting these parts of the body bleed profusely for a minute or two, but unless one of the larger vessels is cut the hemorrhage is usually not dangerous. The person rendering first aid in such cases must not be confused by the amount of blood desposited on the skin surface during the first few minutes of bleeding but must be guided by how much the wound itself is actually bleeding.

Effects of Hemorrhage. The effects of hemorrhage are twofold. One effect is a loss of the fluid elements of the blood and body. The total quantity of blood in the body is

about 5 quarts. The loss of as much as one-fourth of this amount is very serious. The blood pressure drops and the body is dehydrated. This explains the extreme thirst caused by hemorrhage. Another effect is the loss of the red cells, which are the oxygen-carrying components of the blood. With the loss of these cells the supply of oxygen to the tissues is greatly diminished and serious consequences may arise.

Children and old persons are subject to severe hemorrhage, although children tend to recover quickly while the elderly do not. Bleeding which lasts over several days, even with a loss of large quantities of blood, seems to be tolerated better than a sudden extensive hemorrhage of a lesser amount.

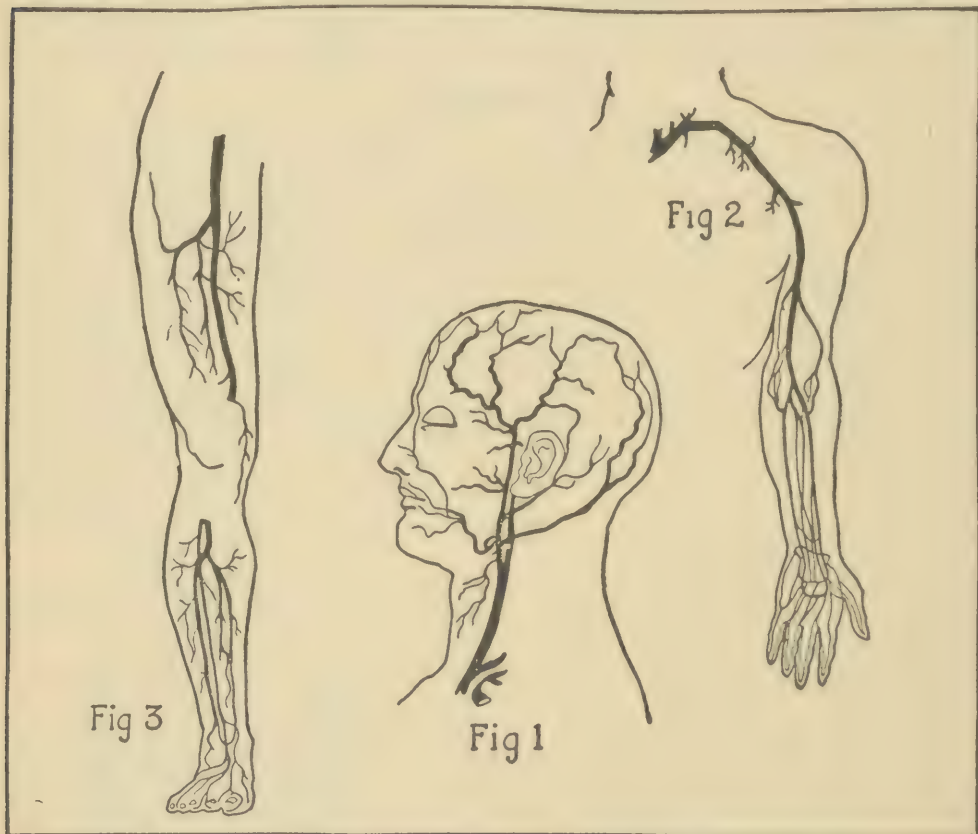


Plate 31. Locations of Main Arteries.

Symptoms. The patient becomes very anemic; the tissues are shrunken as a result of the dehydration; the pulse increases in rate and the respirations become quick and sighing; the skin grows cold, clammy, and pale; and the patient feels faint, suffocated, and is very restless. There may be ringing in the ears and dimness or loss of vision together with fainting. Thirst is often excessive and the patient constantly calls for more water and air.

Methods of Controlling Hemorrhage. The body has only as much blood as it needs, and any loss is detrimental. A small amount of blood may be lost without permanent injury to the body, but if a large amount is lost death results. Loss of blood is the thing most to be feared when an individual is first wounded, and the necessary measures must be taken to stop or greatly reduce this loss. The following are some of the simple methods of arresting hemorrhage:

Natural method. First, and probably the most important, the severed blood vessel has

the remarkable power of self-closure. The blood, immediately upon escaping into the air, coagulates or hardens, forming clots which plug the severed ends of the vessel. Ordinarily, by this natural method, the flow of blood from a wound will stop within three minutes.

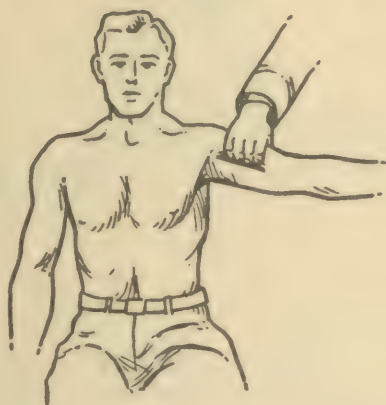
The temporary arrest of arterial hemorrhage results from three factors: (1) *Coagulation of blood in and around the vessel.* If it were not for the ability of the blood to coagulate a person would bleed to death from the merest scratch. This may occur in hemophilia, a disease in which the coagulation of the blood takes place very slowly. Coagulation of the blood is influenced by many factors. Loss of blood tends to increase the



Subclavian artery



Carotid artery



Brachial artery



Femoral artery

Plate 32. Checking Hemorrhage by Digital Compression.

coagulability of the blood. (2) *Weakening of the heart beat.* This results from an anemia of the brain centers and is a fortunate provision since it lessens the flow of blood and permits coagulation to occur. For this reason stimulants should never be used until the bleeding has been properly controlled. (3) *Changes within the artery.* These consist of retraction of the elastic artery in its sheath, allowing a clot to form in the sheath, and contraction of the open mouth of the vessel allowing a clot to form within the lumen of the artery.

General pressure The second method for arresting hemorrhage, and probably next in

importance, is to place a pad or compress of gauze over the wound and secure it there with a bandage. If a bandage is not available the compress may be held in place by hand for about ten minutes. When the bleeding appears to have stopped leave the compress in place; if you remove it to inspect the wound you will probably dislodge the formed clots and start the wound bleeding again. Elevating the injured member also helps to stop the flow of blood.

Specific pressure. The third method for arresting hemorrhage is to shut off the flow of blood to the affected part by manual compression over the main vessels until a clot can form in the wound. The location and courses of the main arterial trunks are shown in Plate 31. The proper places to apply pressure to these trunks are shown in Plate 32. The effects of compression on the flow of blood from the wound should be carefully noted, in order to be sure that pressure is being exerted in the right place. Compression should be continuous for 10 to 15 minutes, after which it may be gently released, but again applied if the wound resumes bleeding.

The tourniquet. The fourth method for arresting hemorrhage is the use of the tourniquet. The tourniquet is a mechanical device used instead of, or to replace, manual compression of a main arterial trunk. It consists of a firm pad and a tight band to hold the pad in place and press it down upon a large artery and so interrupt its flow of blood. Usually, a tourniquet will have to be improvised. The pad may be a tight wad of cloth, or some hard object, such as a block of wood or a smooth stone, wrapped in soft material. The band may be a handkerchief, necktie, belt, or similar article that will make a strong, flat band. A broad rubber band is more effective and less painful than non-elastic bands. The pad is placed over the area to which pressure is to be applied; the band is placed around the arm or leg, over the pad, and is tightened by hand or the assistance of a "twist." (See Plate 33.) The tourniquet is a most useful device, the prompt use of which



Plate 33. Use of Tourniquet.

has saved many lives. But in unskilled hands it is dangerous and should be used with the greatest caution. The most common abuses in using the tourniquet are: unnecessary, too tight, hidden, and left on too long. A tourniquet should never be used when its application is not necessary. It is quite common to see a misapplied or unnecessary tourniquet on an injured extremity that, instead of arresting hemorrhage, has the effect of preventing the natural stoppage of the bleeding. A tourniquet should never be tighter than is necessary to check the bleeding; it is painful at best. Not oftener than every half hour, nor less often than once an hour, carefully and gradually loosen the tourniquet and note whether bleeding starts again. If it does, tighten the tourniquet again. A tourniquet should never be hidden by clothing or a bandage so that it might be overlooked or forgotten. Mark "Tourniquet" plainly on the patient's emergency medical tag. If he is conscious, also caution him to tell medical attendants that he has a tourniquet on. He will usually not fail to do so. Remove the tourniquet as soon as its use becomes unnecessary to control the hemorrhage. If a tourniquet is left on continuously for as long as six hours amputation of the extremity may be necessary.

FRACTURES

A fracture is a broken bone, usually resulting from external violence. Fractures are very common injuries in war and in highway, industrial, and other accidents. They occur most frequently in the bones of the extremities.

Types of Fractures. There are two general classes of fractures; *simple* fractures, in which the skin is not punctured, and *compound* fractures, in which the skin is punctured by the bone itself or by the agent producing the fracture. (See Plate 34.) Fractures may be transverse, oblique, spiral, longitudinal, comminuted (several pieces), impacted, multiple (more than one fracture), and complicated (artery, nerve or soft tissues are damaged).

Symptoms of Fracture. Indications of fracture are:

Signs of local injury, such as pain, swelling, and bruising.

Abnormal mobility of the part.

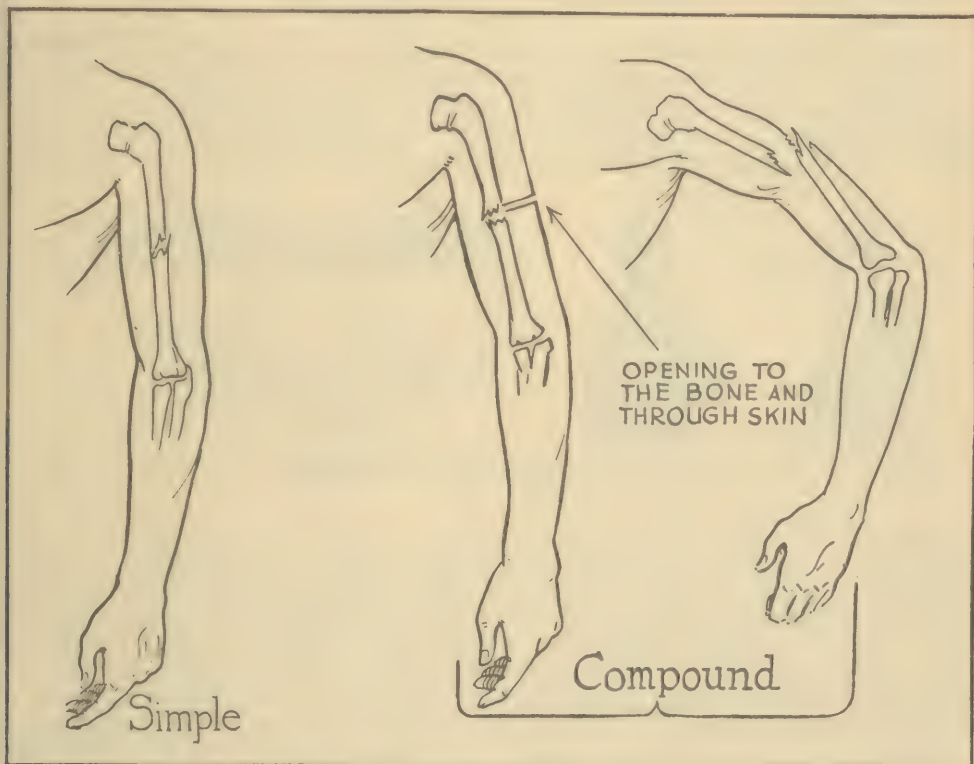


Plate 34. Types of Fractures.

Loss of function in the affected limb.

Crepitus or grating of the bone ends.

Deformity of the part.

First Aid Treatment of Fractures. The immediate danger in the case of fracture is that the sharp, jagged edge of the broken bone, in moving about, will lacerate the arteries, veins, nerves, and muscles or will perforate the skin and become compounded. Such trauma from the bone ends add greatly to shock and may, by severing large nerves, produce permanent paralysis. If a fracture becomes compounded the time of healing is greatly prolonged and frequently the usefulness of the limb or the life of the patient is endangered. Fractures, therefore, should be handled very gently, and patients should not be moved until well splinted and immobilized. In splinting a fracture the joints

above and below the fracture should be included in the splint to secure the maximum immobility.

A *splint* is a piece of stiff or firm material, such as a board, limb of a tree, bayonet, thick magazine, or other suitable object, to which the injured member is bound or bandaged so as to prevent movement of the bone fragments. The principles of the splint are illustrated in Plate 35.

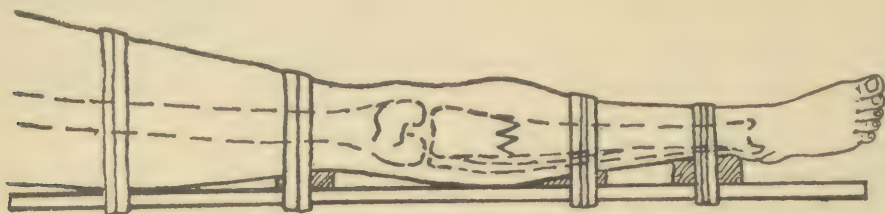


Plate 35. Principles of the Splint.

"Splint him where he falls" is the keynote of the best first aid treatment of fractures. First, gently straighten out the limb to approximately its natural contour or appearance; generally, the easiest and best method is by a gentle, steady pull of the limb in the direction of its long axis. This is called "traction." The previously padded splint is then placed, further padded, and bandaged at enough points to insure that there will be no



Plate 36. Types of First Aid Splinting.

movement of the broken bone. Padding should not be placed over the site of the fracture but above and below it. Splints must be long enough and stiff enough to accomplish their function. A very short or weak splint is useless and may even do harm. Bandages must be snug but not so tight as to interfere with the circulation of the blood. Never waste time trying to diagnose or "set" fractures as a part of first aid treatment. Even the medical officers do not try to make an accurate diagnosis or set fractures under such circumstances. If there is any doubt as to whether or not a bone is broken it should be splinted. Although the normal appearance of the limb has not been restored, nor the broken parts replaced in correct relative position, much has been accomplished in preventing further injury and in the relief of pain. Leave the rest to the medical officer.

After hospitalization more elaborate traction splints or casts are applied to retain the proper apposition of the bone fragments. Plate 36 shows some of the more important types of improvised splinting.

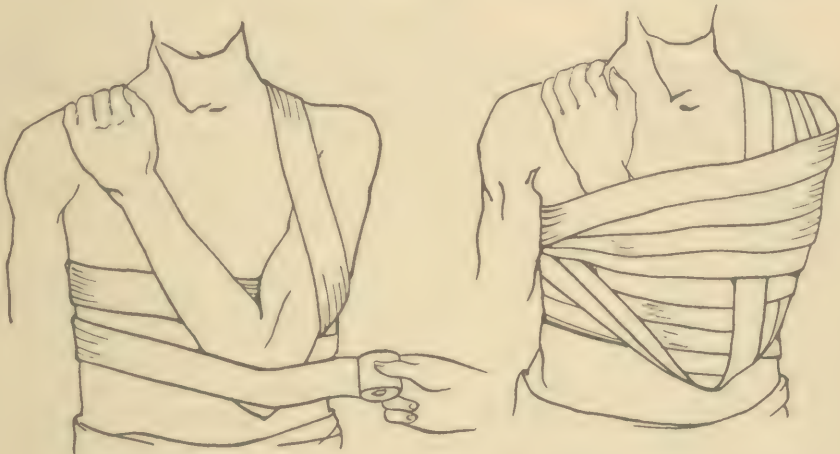
Fracture of the Clavicle. Tie the shoulders back by means of a T-shaped splint or use a Velpau's bandage. (See Plate 37.) A sandbag or similar weight may be placed on the tip of the affected shoulder unless it causes too much pain to the injured person during transportation. If used it should be anchored securely during transportation.

Fracture of the Upper Arm. Apply two splints, one in front, the other behind, if the lower part of the bone appears to be broken. If the fracture appears to be in the middle or in the upper part, apply one splint to the inner side and one to the outer side. Splints may be applied all around the arm. Support by a sling. (See Plates 25 and 30.) The broken arm may also be bound to the side of the body. If a hinged traction splint is

available it should be used. (See Plate 38.) It permits the most comfortable transportation.

For fractures of the humerus near the elbow the Velpeau bandage may be used. It provides immobilization with flexion of the elbow.

Fracture of the Forearm. Place the forearm horizontally across the chest, thumb up; apply a splint to the inner side and one to the outer side of the forearm, both extending from the tips of the fingers to include the elbow joint. Support the forearm with a sling. In the absence of splint material the forearm may also be bound to the body. (See Plates 25, 30, 36, and 38.)



First Step

Finished Bandage

Plate 37. The Body as Splint for Fractured Arm or Collar Bone (Velpeau's Bandage).

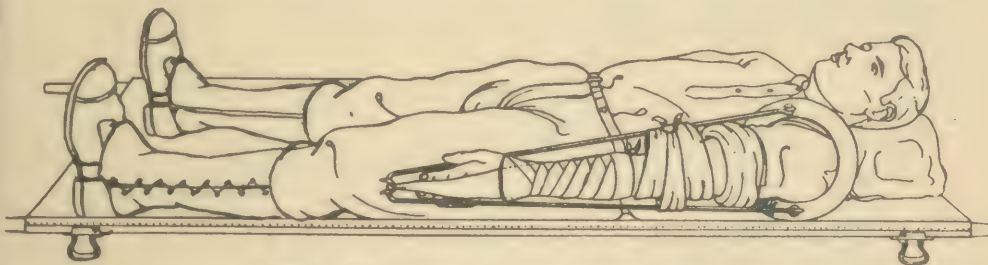


Plate 38. Hinged Traction Arm Splint.



Plate 39. Improvised Splint for Fractured Pelvis.

Fracture of the Wrist (Colles' Fracture). Place the forearm and the palm of the hand on a splint which has a roller bandage or similar enlargement on one end. The palm of the hand should rest upon the roller bandage. The fracture can usually be reduced by

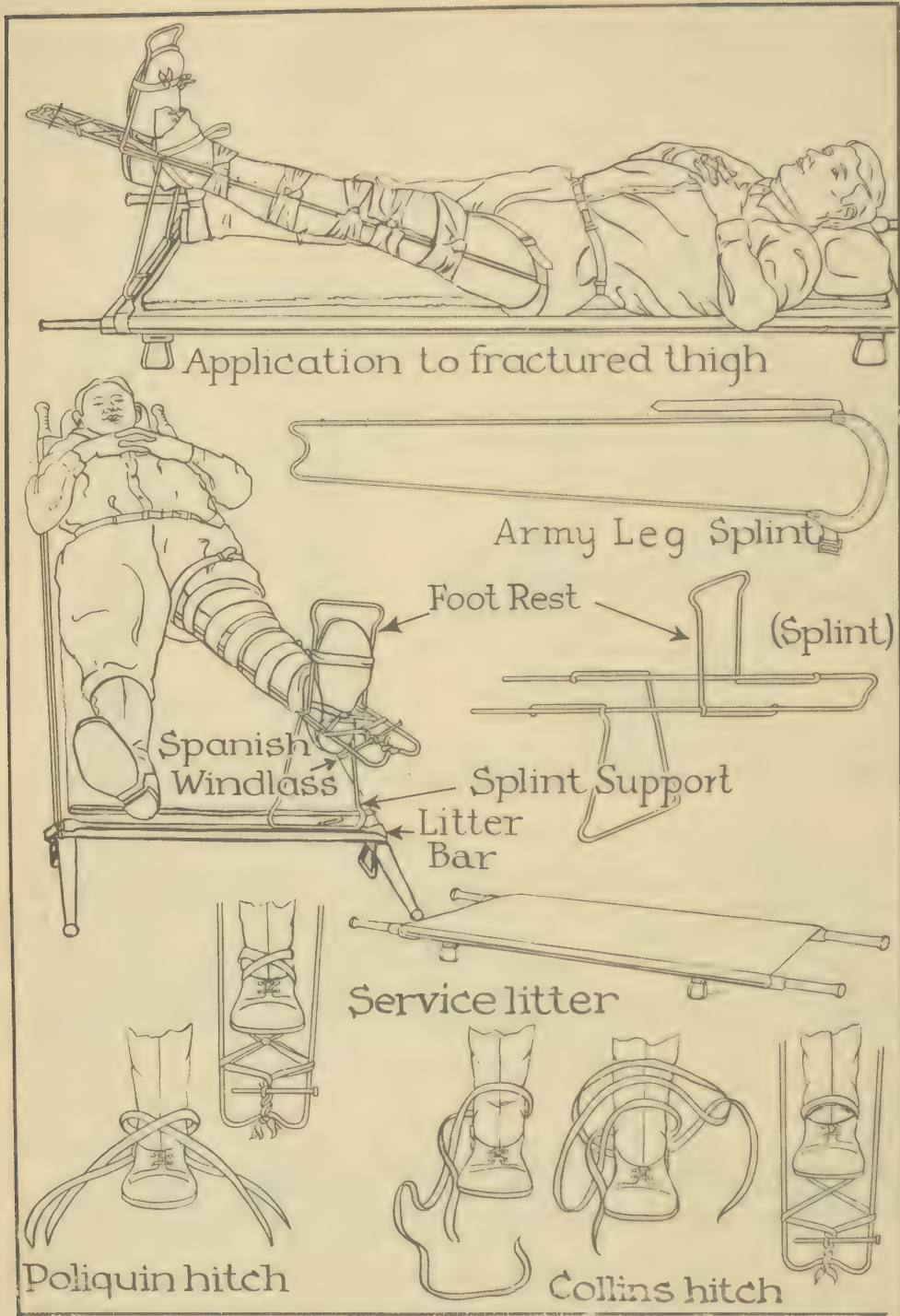


Plate 40. Use of the Hinged Half-Ring Army Leg Splint for Fractured Thigh.

grasping the hand of the patient with your opposite hand as in a handshake; then, aided by your other hand on the patient's forearm, exert steady traction until the wrist is straight. After reduction maintain the traction until the splint above mentioned is applied, securing it firmly but not too tightly by a roller bandage. Check the finger tips to insure proper circulation after application of the splint. Support the forearm with a sling.

Fracture of the Hand. Bandage the hand over a roll of bandage placed in the palm. Support the hand with a sling.

Fracture of the Ribs. Firmly strap the affected side with adhesive tape, extending over the mid-line back and front. If adhesive tape is not available, use roller or muslin bandage going around the chest.

Fracture of the Spine. Extreme care must be used in handling back injuries; when the spinal cord is involved paralysis is present and injudicious handling may increase the injury to the cord. The patient should not be moved until a litter or board has been procured. The door of a house is an adequate splint for transportation. Bring the splint to the patient, place him on it with utmost care, sliding the door under him and taking precautions not to move or bend the spine (lift patient flat, face down). Then transport him, face down, to the nearest medical installation with minimum changes of position.

Fracture of the Pelvis. The best method of transportation support for pelvic fractures is the use of a hammock type of sling. If the fracture involves the *acetabulum*, the splint should include the thigh of the affected side. (See Plate 39.)

Fracture of the Thigh. Apply a long splint on the outer side extending from the arm pit to beyond the foot, and another splint on the inner side extending from the crotch to beyond the foot (See Plate 39). The injured leg can be bound to the sound one if splint material is not available. It should be noted in this as well as in the first aid treatment of fractures of other long bones that an effort is made to immobilize the joint above and the joint below the fracture. If necessary equipment is available the Army hinged half-ring leg splint should be applied. It may also be used for fractures of the lower leg (See Plate 40). Application of the Army hinged half-ring leg splint is described in the section "Training in First Aid Subjects," page 512.

Fracture of the Lower Leg. Apply two splints, one on the inside and one on the outside, each extending from above the knee to beyond the foot (See Plates 40 and 41). Many other improvised splints can be used for fractures of the leg, such as a bayonet, a rifle, a blanket roll, a pillow, or binding the injured limb to the other leg.

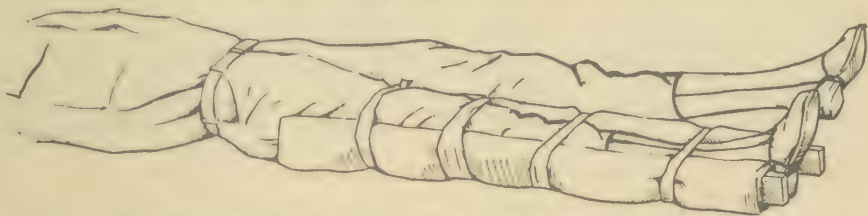


Plate 41. Use of Blanket Roll as Improvised Splint for Fractured Leg.

Treatment of Compound Fractures. The fracture itself is given the same type of first aid treatment as outlined in the case of simple fractures. The complicating wound and bleeding are treated aseptically and a bandage applied before application of the splint. The three different conditions which have to be given treatment at practically the same time are: bleeding, wound, and fracture.

The principal *precautions* to be observed in dealing with compound fractures are:

Handle with the greatest of gentleness.

Use the utmost surgical cleanliness possible.

Do not try to do too much.

SPRAINS AND DISLOCATIONS

Two types of injuries which are closely related and often confused with fractures are sprains and dislocations. They are caused by external violence directly or indirectly to the affected part of the body. Either may accompany fractures.

Sprain. A sprain is a tearing or stretching of the ligaments of a joint or of the tendons of muscles that insert close to the joint. A sprain should be treated by putting the affected member at rest and by application of cold packs when practicable to limit the effusion and swelling about the joint. Avoid bandaging too tightly at first as swelling may impair the blood supply and cause more damage. When the swelling has subsided, the application of hot compresses may be used to increase circulation and stimulate healing. Strength of the joint can then be increased by the use of adhesive plaster strapping to limit the motion of the joint during early convalescence. (See Plate 42.)

Dislocation (Subluxation). A dislocation is a condition in which the articular surfaces of bones are partially or completely separated from one another.

In *dislocation of the jaw* the mouth is held wide open and cannot be closed. Treat by padding your thumbs, then pressing downward and backward against the lower molar teeth until the *mandibular condyle* is free and snaps back into place. Do not persist in reducing the dislocation as a first aid measure but secure the services of a medical or dental officer.

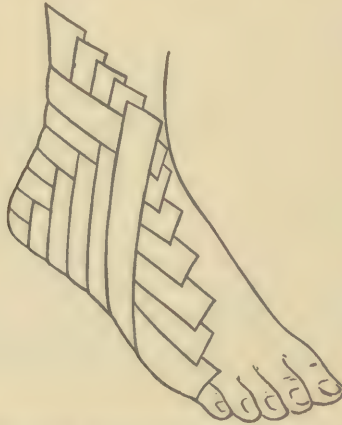


Plate 42. Adhesive Strapping of the Ankle for a Sprain.

In *dislocation of the shoulder* the top of the shoulder is hollow and not rounded out as on the opposite side; the elbow sticks out from the side and when the affected hand is placed on the opposite shoulder the elbow cannot be brought against the chest. If reduction is attempted it should be done very gently. Occasionally, careful manipulation or traction with the heel (without shoes) of the operator in the *axilla* will slip the bone into place. If not, an anesthetic is required and Kocher's method may be tried. This consists of grasping the elbow with one hand and the wrist with the other while the patient is recumbent. Pull gently to get slight extension; *rotate* the arm firmly and steadily *outward* as far as it will go with the elbow pressed to the side. Next draw the elbow steadily *forward* and *upward* as far as it will go with the arm still rotated outward. Finally, bring the hand across the front of the chest and place on the tip of the opposite shoulder while the elbow is drawn across and brought against the chest. The arm should then be bandaged to the side.

Backward *dislocation of the elbow* is the most frequent. The joint cannot be moved: it is in a semiflexed position and the displaced bones project prominently behind. To reduce, place the knee in the bend of the elbow, pull the arm forward against the knee and slowly and forcibly bend the forearm to a right angle. It is bandaged in this position. Do not be rough and in case of doubt do not attempt reduction.

Dislocation of a finger is usually reduced easily by gentle steady traction on the affected finger. The patient should be seated or recumbent during the manipulation in order to fix his position and insure steady traction.

Dislocation of other joints may occur, and involve the *wrist, hip, knee, and ankle*. Dislocations of the knee are reduced without much difficulty by flexing the thigh, applying traction and manipulating the knee joint, pushing the bones in place. The knee must be splinted afterwards. Frequent dislocation of one or more of the semilunar cartilages of the knee joint will require operation, tightening the ligaments or removing the cartilages to secure permanent cure. Dislocations of the wrist and hip are rare. Dislocation of the ankle requires surgical procedure for correction.

TRANSPORTATION OF THE SICK AND WOUNDED (FM 8-35)

Severely injured or seriously sick persons should be carried on a litter whenever possible; it is usually better to let them lie until suitable transportation is available. Severely wounded soldiers, or those suffering from shock, should be carried on the service litter.



Fig. 1. The "Supporting Carry."

Fig. 2. The "Arms Carry."

Fig. 3. The "Straddle-back Carry."

Plate 43. Manual Transport of Wounded by One-Man Carry.

Manual Transport. The injured or sick who are unable to walk may be moved short distances without the aid of a litter. Patients not too seriously wounded may be assisted in walking, or be carried by one man. If the litter bearer has no assistant he proceeds as follows: turn the patient on his face, step astride his body facing his head; place hands under his armpits and raise him to his knees; clasp him around the waist and raise him to his feet (Plate 44, Figs. 1-4). If he is conscious and can walk with assistance, seize his left wrist with your left hand and draw his left arm around your neck. Support him with your right arm around his body, his left side resting against bearer's body. (See Plate 43, Fig. 1.) This method is known as the "supporting carry." It cannot be used with an unconscious person.

To transport a patient "by arms carry," proceed as in last case in raising him to the erect position, then pick him up as shown in Plate 43, Fig. 2.



The easiest method of one man carry is by the "Fireman's Carry." Raise the patient to his feet as previously described. While supporting him erect pass around and face him. Grasp his right wrist with your left hand and pull forward; stoop and pass your right arm between his legs, at the same time drawing him across your left shoulder. Pass the patient's right wrist to your right hand, reach back and grasp his left wrist with your left hand and draw patient's left arm around to steady him. The various steps from lying on the ground to the completed "carry" are shown in Plate 44. This method may be used to carry an unconscious person as well as a conscious one.

In the "straddle-back carry" raise the patient to his feet as previously described, step in front of him, your back to patient, stoop and grasp his thighs, rise to position shown in Plate 43, Fig. 3, bringing the patient well up on your back. This method cannot be used except with the assistance of the patient.

The usual method of a two-man carry is shown in Plate 45, Fig. 1, and is self explanatory. Serious injury to the arms or legs may preclude the use of this method.

A seriously wounded man may be carried in a recumbent posture by two-man carry as shown in Plate 45, Fig. 2. Both bearers must be on the same side of the patient. He should be carried well up on the chests of the bearers.

Transport by Litter. Usually the wounded man should be laid on his back on the litter, his limbs disposed naturally. "Bring the litter to the patient, and not the patient to the litter." Tight clothing, especially collars and belts, should be loosened. Clothing may be cut to inspect and treat his injuries but should not be pulled off in a manner which will disturb the patient. Do not remove clothing, as it is needed to retain



Fig. 1. The Saddle-back Carry.

Fig. 2. The Arms Carry.

Plate 45. Manual Transport of Wounded by Two Bearers.

warmth. Cover the patient with a blanket or overcoat. An injured individual nearly always asks for water; give him liquids, preferable hot, unless the wound is in the abdomen. Do not give him liquor. He should be properly prepared for his journey so that he need not be disturbed again until he reaches the aid station. A patient having once been placed on a litter should not be removed from it until he reaches the hospital.

Improvised litters. In the absence of a service litter, one may be improvised out of poles supporting a bed. The bed may be a blanket, overcoat, shelter tent, bedtick, poncho, bags, chicken wire, or other suitable article or material. It is best to form a framework by lashing two short poles across the ends of the long ones to keep them

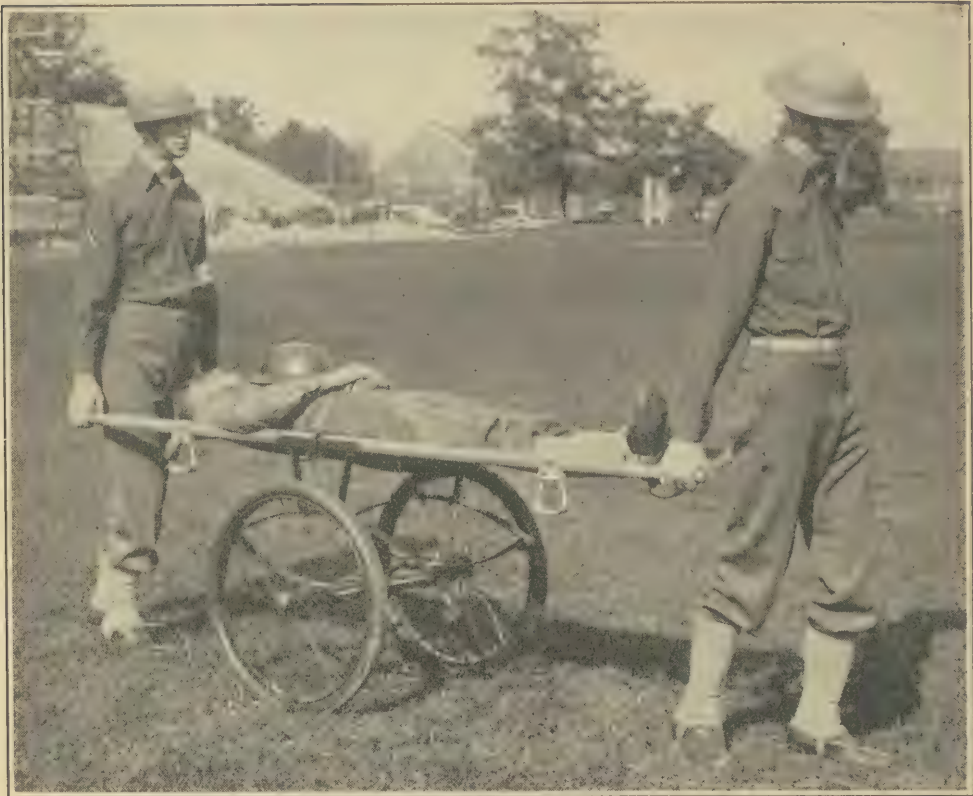


Plate 46. The Wheeled Litter Carrier.



Fig. 1. Carlisle Cacolet.

Fig. 2. 1st Division Cacolet.

Plate 47. Transport of Patients by Cacolet.

apart. The long poles should be about 7 feet, the short ones about 3 feet in length. An ordinary camp cot makes a very satisfactory litter.

Adjuncts to the Litter. Every effort should be made to minimize the task of the litter bearers since the *critical point* in the chain of evacuation, within the division, lies between the casualty on the field and the most forward ambulance. The use of advanced ambulance posts and mechanical devices which will aid the litter bearers and accelerate the evacuation are recommended and employed whenever feasible.



Plate 48. Placing Wounded on a Horse and Carrying on Horseback.

The *wheeled litter carrier* is a valuable mechanical aid. (See Plate 46.) It is a collapsible, two-wheeled cart, capable of transporting one loaded litter. When employing the carrier over suitable terrain, the litter squad may be reduced to two men and yet be able to perform the same task with greater rapidity and less fatigue (FM 8-35).

The *Cacolet* is a mechanical device used for transportation of patients upon an animal. There are two common types of cacolet, one known as the Carlisle Cacolet and the other as the 1st Cavalry Division Cacolet. Both are fitted to the Phillips' pack saddle, the former for two patients and the latter for one. For details of these devices see FM 8-35.



Plate 49. Carrying Wounded on Travois.

Horseback. The assistance required to mount a disabled man will depend on the site and nature of his injury. In many cases he is able to help himself materially in mounting. The horse, blindfolded if necessary, is to be held by an attendant.

To load, the patient is placed on the horse from the near (left) side. The patient having been lifted is carried to the horse, patient's body parallel to that of the horse and close to its side, his head toward the horse's tail. He is then raised and carried carefully over the horse until his seat reaches the saddle, when he is lifted into position. One man goes to the off (right) side and puts the patient's right foot into the stirrup. The other man puts the patient's left foot in the stirrup. (See Plate 48.)

To *unload*, the patient's feet are disengaged from the stirrup and his right leg swung over the pommel, one man going to the off side for this purpose after which he resumes his post at the left side. The patient is brought to a horizontal position, gently lifted over the saddle and carried backward until free of the horse, and lowered to the ground.

The patient, when mounted, should be made as safe and comfortable as possible. A comrade may be mounted behind him to guide the horse, otherwise a lean-back may be provided, made of a blanket roll, a pillow, or a bag filled with leaves or grass. If the patient be very weak the lean-back may be made of a sapling, bent into an arch over the cantle of the saddle, its ends securely fastened, or some other improvised framework to which the patient is bound may be made.

The Travois. The *travois* is a vehicle intended for transporting the sick and wounded when the use of wheeled vehicles or other means of transportation is impracticable. It consists of two long poles, one end of each pole being attached like shafts to the side of a horse, the free end dragging on the ground. Behind the horse, cross bars extend between these poles, holding them parallel and affording support for a patient. (See Plate 49.)

A travois may be improvised by cutting poles about sixteen feet long and two inches in diameter at the small end. These poles are laid parallel to each other, large ends to the front and $2\frac{1}{2}$ feet apart. The small ends should be about three feet apart, with one of them projecting eight or ten inches beyond the other. The poles are connected by two crossbars, the first of which is about six feet from the front ends and the second about six feet back of the first, each notched at its ends and firmly lashed to the poles. Between the cross pieces the litter bed, six feet long, is filled with canvas or a blanket which is securely fastened to the poles and cross-bars, or filled with rope, lariat, or rawhide strips, stretching obliquely from pole to pole in many turns, crossing each other to form the basis for a light mattress or an improvised bed. A litter may be



Figure 1. Side view.

Figure 2. Rear view.

Plate 50. An Army Ambulance.

made fast between the poles to answer the same purpose. The front ends of the poles are then securely fastened to the saddle of the animal. A breast strap and traces should, if possible, be improvised and fitted to the horse. On the march the bearers should be ready to lift the rear end of the travois when passing over obstacles, crossing streams, or going uphill.

Precaution. There is one definite consideration which must be kept in mind before transporting a sick or wounded person: "Will transportation be detrimental to the patient to such an extent that he may lose his life or be permanently disabled therefrom?" Often the necessary treatment must be given at the site where the accident occurred in order to prepare the patient for transportation. The time required and the factors

involved are dependent upon the weather, nature of the terrain, facilities for treatment, and the condition of the patient.

Ambulance Transportation. There are various types of ambulances used in the military service: the metropolitan ambulance (general hospitals in the zone of the interior) and the motor field ambulance (station hospitals) the cross-country, 4-wheel drive, motor field ambulance; the four-animal drawn ambulance; and the two-animal drawn ambulance. The ambulance conforms in principal to the passenger automobile, affording the maximum degree of riding comfort for distant transportation of the sick and



Plate 51. Truck (2½ ton) fully loaded with fifteen litter patients in a head to foot arrangement. Three patients are placed lengthwise on the bed of the truck.



Plate 52. Truck (1½ ton) fully loaded with ten litter patients. Two of the patients are placed lengthwise on the truck bed.

wounded. (See Plate 50.) Care should be taken in the loading and unloading of patients from the ambulance to keep the patient level and to make all movements without jerking. The speed at which the ambulance may be driven depends upon the condition of the ground or roads over which it is driven.

If an ambulance is not available, a cot or litter may be suspended from the top of an Army truck. Someone must remain near the litter to prevent horizontal sway. If the truck has no top beams, cover the truck bottom with straw or grass before placing the litter thereon.

In an emergency cargo trucks may be improvised to carry a large number of patients. Fifteen litter cases may be transported in a 2½ ton cargo truck. (See Plate 51.) The litters are held in place by sliding 2" x 4" boards between the litter stirrups and the bows of the truck. The poles of the litters are made secure to the bows of the truck by tying with the litter slings.

Ten patients may be transported in a similar manner on the 1½ ton cargo truck (See Plate 52). Three to five patients may be transported on the ¼-ton truck (jeep) which has special attachments for supporting litters.

FIRST AID IN COMMON EMERGENCIES

Some types of accidents occur more frequently in civil life than in the Army, and every person should know the principal signs or symptoms of common injuries and the simple first aid measures useful in their immediate care. The measures to be taken are all very simple and are generally effective. It is well for the layman to wish to aid those who have met with an accident, but he must apply the correct actions since the wrong thing may harm the injured person rather than help him. In case of doubt as to what to do, there is one important rule: Secure at once the services of a doctor. While waiting for his arrival measures should be taken to assist the patient to be comfortable.

Shock. Shock is a condition of extremely depressed or lowered vitality, usually the result of a severe wound or injury but also caused from such conditions as fear, poisoning by chemicals, excessive heat, lack of nutrition, and hemorrhage from causes other than external injuries. The degree of shock is usually greater in the old, the weak, or poorly nourished, the physically exhausted, or individuals with a highly impressionable nervous system.

Shock is quite easily recognized. Its principal symptoms include: pallor of the skin; a cold sweat especially on the forehead; an anxious, frightened expression; sighing or irregular breathing; weak and irregular pulse; body temperature below normal (cold and clammy); and sometimes nausea and vomiting. The patient may become unconscious.

The earliest first aid measures in severe injuries should always include anti-shock treatment, even though symptoms of shock may not have appeared. Following are the principal first aid measures to be taken to prevent, or combat, shock.

Make the patient as comfortable as possible, lying on his back, limbs straightened out, with the head low and clothing loosened. Arrest hemorrhage (bleeding); reduce pain; dress wounds; splint fractures. If practicable move the patient to a warm room. In any event keep him warm and dry. Use blankets or clothing and hot water bottles, canteens filled with hot water, or other sources of external heat. Be careful to avoid burning him, as the victim of shock will often be too depressed to notice that he is being burned. Unless his injury is in the chest or abdomen give him hot drinks if he is conscious. Keep him perfectly quiet and permit him rest and sleep. In mild cases of shock, warmth and quiet are sufficient. In severe cases, however, active measures must be carried out as promptly as facilities will permit; death frequently follows inadequate anti-shock treatment.

Pain in the Abdomen. Pain in the abdomen may be due to a variety of causes, many of which are serious. In any case where there is nausea and vomiting, accompanying or following pain over all or any part of the abdomen and with pain and tenderness in the lower right part of the abdomen, appendicitis should be suspected. Appendicitis may also occur without nausea. Always put suspected cases to bed and call a medical officer. As a general working rule, *never give patients with abdominal pain or tenderness food, water, a laxative, or an enema unless ordered to do so by a medical officer.*

Fainting. Except as a symptom of severe shock this condition is seldom dangerous. Lay the patient on his back with the head lower than the rest of the body if practicable, loosen clothing, give plenty of fresh air, and give stimulants (when consciousness is

regained) carefully and slowly. A cold compress on the head is beneficial. This is usually placed on the forehead or the back of the neck. Sprinkling cold water on the head and face may be done in lieu of a compress. The arms and legs may be rubbed, rubbing from the hands or feet toward the body. Aromatic spirits of ammonia inhaled or taken by mouth in small doses are considered useful.

Concussion of the Brain. Concussion of the brain is a shock caused by abrupt violent force against the skull, injuring the brain but with insufficient force to fracture the skull. The patient is pale and weak, always dazed and sometimes unconscious. He should be examined carefully for evidences of a fractured skull—bleeding from the internal ears, bleeding or escape of cerebro-spinal fluid from the nose or mouth, evidences of paralysis of eye muscles, face, or extremities. Treat as you would for shock.

Compression of the Brain and Fractured Skull. This is a much more serious condition than the above. If the compression is due to hemorrhage from the arteries of the dura (middle meningeal artery) there is usually immediate unconsciousness following the injury, followed by return to consciousness. This in turn gives way to a gradually increasing stupor with symptoms of slowly developing paralysis. Operation (subtemporal decompression) is the treatment required. First aid treatment consists chiefly in keeping the patient quiet and treating for shock.

Fractures of the base of the skull can usually be recognized by bleeding and escape of cerebro-spinal fluid, from the ears and nose, together with paralysis of the various cranial nerves (eyes, face) or of the limbs. There is usually compression of the brain which is evidenced by a rising blood pressure, a slow and falling pulse, and slow breathing. These cases should be kept quiet and treated for shock. A rising blood pressure and gradually slowing pulse, particularly if the compression can be localized by areas of paralysis, calls for a decompression of the brain. Lumbar punctures to relieve pressure may be performed.

Apoplexy. This is due to a rupture of a blood vessel in the brain. It seldom occurs below the age of 50. The patient suddenly falls, is usually unconscious, and is paralyzed. Paralysis of the face may be recognized by a drooping of the corner of the mouth on that side and a smoothing of the wrinkles. If an arm or leg is paralyzed it falls quickly and heavily when dropped on the bed while the opposite arm drops a little less heavily (even if the patient is unconscious), due to muscular elasticity. The treatment consists of rest and quiet. No stimulation should be given at first lest the bleeding be increased.

Epileptic Convulsions. Epilepsy is a nervous disorder in which there is very little warning of an approaching convulsion. The individual usually cries out and immediately falls in a severe convulsive fit. The limbs stiffen out for a few moments and then clonic contractions usually begin in the extremities, followed by foaming at the mouth and complete unconsciousness. Nothing can be done to avert the fit. The only treatment is to prevent the patient from injuring himself in the fall or in his convulsive movements. The tongue is frequently severely bitten. To prevent this it is well to pad a spoon handle, tongue depressor, rolled towel, clothes pin, or the like and insert between the teeth during the attack. Do not try to hold the patient in his struggles but place him on a mattress or other soft object to prevent his injuring his head or limbs by striking them against a hard object. After the convulsions the patient may remain unconscious from a few minutes to several hours, appearing as though in a deep sleep. The pulse should be checked to note the general condition of the person afflicted. This will also assist in differentiating epilepsy from other conditions. After the convulsions cease, inspection of the tongue for possible injury, and the presence of a foamy substance in the mouth will often determine the diagnosis. If the patient is questioned after awakening he will usually admit a history of previous attacks.

Unconsciousness. Unconsciousness may result from any one of a number of causes, the more common ones being: fainting, head injury, concussion of the brain, severe alcoholic intoxication, apoplexy, epilepsy, diabetes, chronic kidney disease (uremia), wound shock, electric shock, toxemia, and thermal accidents. In cases where the type and cause of the unconscious state are unknown, and the unconsciousness persists for more than a few

minutes, send for a doctor; place the patient in a comfortable position, the head level with or below the body, the limbs naturally disposed; loosen tight clothing; give the patient plenty of air; keep him quiet; and isolate him from all persons not actually needed to help him. *Never attempt to give liquids to an unconscious person.*

Asphyxiation. Asphyxiation is a condition of unconsciousness due to suffocation or interference of any kind with the oxygenation of the blood. Several causes of asphyxia are as follows:

Mechanical obstruction preventing air from reaching the lungs.

Strangling external pressure on the respiratory passages.

Foreign bodies in the respiratory passages of sufficient size to embarrass respiration. Water or fluids (edema) in the respiratory passages, such as occurs in drowning or diseases of the larynx.

Inflammation and swelling of the throat or the presence of an obstructive membrane as in diphtheria.

Weakness or spasm of the respiratory muscles.

Whooping cough, poliomyelitis, paralysis of the upper part of the spinal cord, and convulsions.

Dysfunction of the respiratory center of the medulla.

Degenerative cardio-reno-vascular diseases or heart failure.

Inhalation of smokes and poisonous gases.

Sufficient inhaled concentrations of irritating or toxic smokes, illuminating gases, gasoline motor exhaust fumes (carbon-monoxide), ammonia fumes, and war gas fumes.

The treatment of asphyxiation depends upon its cause. However, in the majority of the cases, artificial respiration is most commonly used. The cause must be removed before artificial respiration will be able to restore respiration. The pulmotor or other mechanical means of artificial respiration should be used by experienced operators only and with due consideration of the condition of the respiratory tissues.

Artificial Respiration. Artificial respiration is the assisting of or starting of respiration in a person in whom it has ceased (the new-born is an exception). The methods used must supplement the respiratory apparatus of the individual involved. It is one of the most important procedures a first aid operator should know. There are several known methods: Schäfer, Sylvester, Howard, Laborde, and the mechanical respirators.

The Schäfer method. Experience has indicated that the Schäfer method is the easiest to administer and has proven to be the most effective and least injurious first aid measure. Mechanical respirators are not usually available immediately. Schäfer describes his method as follows:

"It consists in laying the subject in the prone posture, preferably on the ground, with a thick folded garment underneath the chest and epigastrium. The operator puts himself athwart or at the side of the subject, facing his head, and places his hands on each side over the lower part of the back (lowest ribs). He then slowly throws the weight of his body forward to bear upon his own arms, and thus presses upon the thorax of the subject and forces air out of the lungs. This being effected, he gradually relaxes the pressure by bringing his own body up again to a more erect position, but without moving the hands."

The movements are repeated regularly and should average about twelve to fifteen per minute, therefore requiring about 5 seconds for each manipulation. To avoid too rapid procedure the use of the following words are advocated. As pressure begins on the chest say, "One thousand one, one thousand two, one thousand three," at the end of which release the pressure; withhold the pressure but hold the hands on the back while you repeat, "One thousand one, one thousand two," at the end of which reapply the pressure slowly, throwing the weight of the body forward on your arms. If the patient is small and you are large, be careful that you do not injure the patient by using all your weight for pressure. Continue your efforts to revive the patient for an hour or more. The pressure should be extended downward and forward, thereby simulating the function of the lower respiratory muscles and diaphragm. Do not give up, but

persist until a doctor arrives. He can determine by examination if your further efforts will restore life.

Drowning. A person suffering from submersion is commonly spoken of as having been "drowned." It should never be assumed that the person removed from the water is *dead* unless he is definitely known to have been submerged for a long time. No fatal

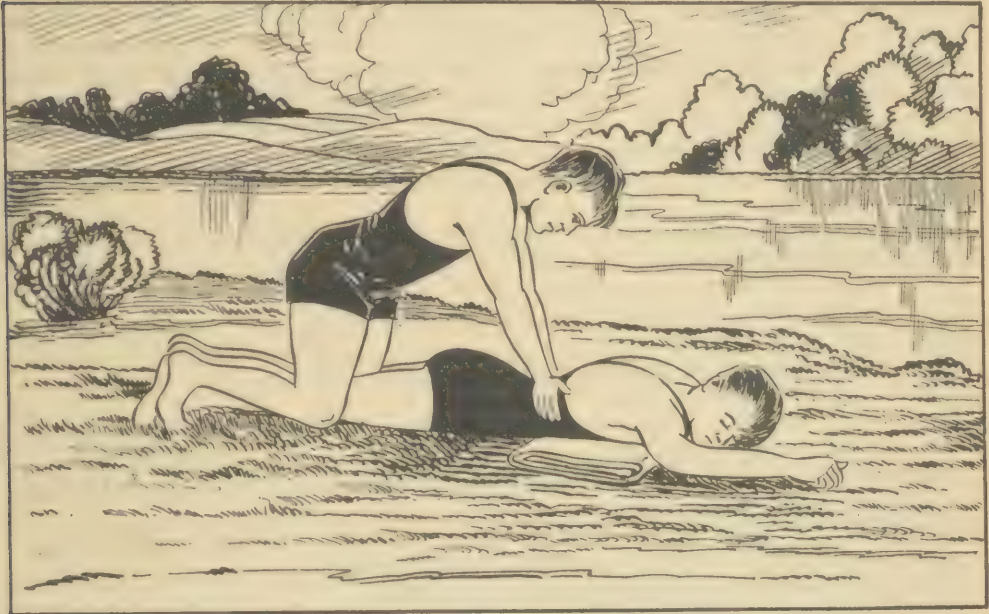


Plate 53. The Schafer Method of Artificial Respiration.



Plate 54. First Step in the Resuscitation of the Drowned.

time limit of submersion can be given since it varies with the individual case. Also, to excited eye-witnesses a few seconds, let alone a couple of minutes, seem like hours. The "drowned" person has stopped breathing and to resuscitate him his breathing must be started by artificial means. As soon as the victim is out of the water turn him face downward, step astride him, and grasping him around the body near the hips lift him so that

his head and chest hang well down; hold him in that position for at least 15 or 20 seconds to allow the water to drain out of his air passages. Then start artificial respiration at once, on the ground or in a boat. Do not waste time in removing clothing, seeking signs of heart action (life), or removing the patient to a more convenient spot. Continue the artificial respiration until he breathes well of his own accord, or until quite sure the case is hopeless. Either circumstance may require from an hour to three hours of artificial respiration. After he begins to breathe, watch carefully to see that he does not stop, and continue to assist him if necessary. A dry feather or a mirror held in front of the patient's nose will indicate whether artificial respiration is actually being produced, and will also show when the patient begins to breathe naturally. External heat may be applied while the resuscitation efforts are being made, taking care not to burn the patient. Do not attempt to give him liquids of any kind until he is conscious; then give stimulants and keep him warm. Make no attempt to move him until he is breathing naturally.

Prevention of drowning accidents. Observation of the following, simple ten commandments will prevent many drownings:

Don't swim immediately after eating; wait at least two hours.

Don't go swimming alone unless you are an expert.

Don't swim if overheated.

Don't swim if you know you have heart trouble.

Don't continue swimming when exhausted.

Don't wade into water with your hands above your head; you may step into a hole and you should be ready to stroke.

Don't struggle if caught in a swift current or undertow; the force of the current will bring you to the surface.

Don't fight or struggle if you "swallow water"; clear your windpipe of water first.

Don't cry for help in fun; you may really need it some time.

Don't dive without knowing the depth of the water.

War Gas Poisoning. Symptoms produced by gas in chemical warfare and the treatment of gas casualties are discussed in Chapter VIII.

Choking. A person being suffocated by a substance lodged in his windpipe (usually food) gasps for air, clutches at his throat, and may cough violently. His face turns blue, and he exhibits great fear. Prompt removal of the foreign body is necessary or death will ensue, unless the supply of air reaching the lungs is sufficient for life. Have a doctor called at once, telling him the circumstances briefly so that he may bring the proper instruments. Cause the patient to cough and slap him violently on the back between the shoulder blades. If this is insufficient, hold him with his head and chest down and again slap him on the back. Sometimes a foreign body lodged in the throat can be removed by inserting a finger into the throat, dislodging the object. The patient may then cough it out.

Alcoholic Intoxication. Alcoholic intoxication is a condition in which there is a varying degree of unconsciousness which results from imbibing an excess of alcoholic liquids. A person unconscious from alcoholic intoxication is "dead drunk." In severe alcoholism the face is flushed, eyes are red and bloodshot, pupils dilated, breathing slow and regular, and the breath is heavy with the odor of alcohol. Voluntary movements are usually uncoordinated. The individual may be stuporous or unconscious; if so, he may be aroused but quickly returns to his stupor or unconsciousness. The most important thing to be remembered about alcoholism is the possibility that the unconscious state may be due to some other cause even though there is an odor of alcohol. Ordinarily, alcoholism does not require any particular treatment. Vomiting may remove some of the alcohol from the stomach; it may be induced by having the patient drink copiously of warm salt water or mustard water. A cup or two of strong, black coffee, or one-half to one teaspoonful of aromatic spirits of ammonia in water, are useful in helping to sober a drunken person. Bed rest is valuable and usually necessary.

Thermal Injuries. Thermal injuries are injuries to the body caused by excessive heat or cold. Chemicals, in addition to their toxic effect, may produce a thermal injury.

The effect of heat or cold may be either general or local. Some of the common thermal accidents and the first aid treatment to relieve them are as follows:

Sunstroke is a rather rare condition but quite alarming when encountered. It results from exposure to the direct rays of the sun or other source of high temperature. Usually the victim is unconscious, his face is flushed, his skin is *very hot* and dry, his breathing labored, and his pulse rapid and strong. Call a doctor at once. Move the victim to a cool, shady spot; loosen his clothing, and apply ice or cold towels to his head and body. Do not give him any stimulant, even if he is conscious. The victims of such a thermal accident often have a preceding headache, dizziness, and nausea, and a feeling of being oppressed by the heat. Should they go in time to a cool, shady spot and lie down, actual sunstroke may be prevented.

Heat exhaustion is a rather common condition, usually the result of continued exposure to heat and humidity, indoors or outdoors. The victim of heat exhaustion is in a state of shock, as described above. The treatment is the same as for shock. Heat exhaustion is a preventable condition. Men who are losing large quantities of body fluids by profuse sweating should take a small amount (a quarter teaspoonful) of table salt with each meal.

Burns and scalds. Burns are injuries caused by hot solids or flames coming in contact with parts of the body. Scalds are injuries caused from hot liquids. Burns are classified as first, second, or third degree, depending upon the amount of damage to the body tissues:

First degree burn—redness of the skin.

Second degree burn—blistering and redness of the skin.

Third degree burn—charring and destruction of the deeper tissues. First and second degree burns are also usually present in proximity to third degree burns.

The immediate effect of a burn is the local effect; if sufficiently painful and extensive it will cause shock. After absorption of the toxic products of a burn, the resultant toxemia may produce vital changes in the liver and kidneys, making treatment of the patient very difficult. Proper first aid treatment will do much to prevent such complications later. The treatment of burns and scalds is similar.

Treatment of burns and scalds. Carefully remove the person burned to an area of relative cleanliness where the clothing can be gently removed from the affected part without increasing the chance of future infection. If the burn is extensive (third degree burn) a doctor's services should be secured immediately as the correct, early treatment may prevent possible permanent disability. Do not apply grease, salve, oil, or any household remedy. Use nothing on the burn that will be difficult to remove afterwards. If the patient insists that something be used apply bicarbonate of soda as it is easy to remove. Place clean linen under the patient and protect the burned portion from the drafts of air by a frame or cradle holding the covers off the body. Keep the patient warm and as comfortable as possible until the doctor arrives. Treat for shock if indicated.

If the burn is not extensive or severe (first or second degree) a tannic acid ointment (5 per cent) or a picrate ointment may be applied to the affected area. Bandages should be sterile and placed on very loosely. Do not open blisters.

Precautions in case of fire. Keep cool, do not get excited. If a person's clothing is on fire make him lie down or throw him to the floor or ground. Smother the flames by wrapping him in a blanket, rug, coat, or similar article. If your own clothing catches afire when you are alone, lie down on the floor and roll up as tightly as possible in a rug, blanket, or similar article, leaving only the head out. If there is nothing in which to wrap yourself, lie down and roll over slowly, at the same time beating out the fire with the hands. If caught within or obliged to enter a house which is full of smoke, cover the mouth and nose with a wet cloth or handkerchief. Remember that there is less smoke within 6 inches of the floor than above that level, so when you can no longer breathe in an upright position get down and crawl with the mouth close to the floor.

Electric shocks and burns. Electric shocks and burns result from contact with wires or equipment carrying a high tension current. The most important thing to do is to re-

move the person from such contact. This is always dangerous and should not be attempted until the rescuer has some way of insulating himself, otherwise he may receive as severe a shock or burn as the person he is trying to rescue. First, take steps to have the power cut off. Stand on a heavy rubber mat, or dry boards, and protect the hands with some insulating material such as heavy rubber gloves, several thicknesses of dry cloth, or other non-conductor, before attempting to separate the victim and the source of the current. It may be easier to push the wires aside, or the victim away from the source of electricity, using a long piece of dry wood while standing on a dry or insulated platform. Electric shock causes symptoms similar to wound shock and is treated the same way. It arrests respiration if the shock is severe, and artificial respiration must then be used. Electric burns are treated the same as burns from other causes.

Injuries from freezing. The first effects of extreme cold are pain and a sensation of cold followed by numbness, stiffness, a great drowsiness, and a desire to lie down and sleep. If yielded to, this desire for sleep may lead to death unless the person receives adequate and careful treatment. The most common injury resulting from freezing is that of frost-bite or chilblain, affecting parts of the body which are exposed and have the least circulation.

The rational treatment of freezing and frost bite must be based upon the safe restoration of the physiology of the tissues involved. The traditional treatment for freezing and frost bite is irrational. Vigorous rubbing with snow or ice (the traditional treatment) is poor because the small veins and capillaries in the frozen part or parts are already filled with small ice-crystals and the tissue is stiff and brittle. The part looks white or bluish-white. Since the circulation has ceased in the frozen part, any heat applied to it will not be conducted away. The tissue will be more sensitive to heat, and more easily damaged by heat if it is used to thaw the part. No temperature higher than the normal temperature of the body should be used in the treatment of frost bite.

The person suffering from freezing should be removed to a moderately warm shelter and permitted to reestablish gradually the normal circulation without undue physical disturbance. When the patient can swallow, mild stimulants such as warm liquids may be given. The affected frozen part or parts should be immersed in water at a temperature of 99.5 degrees Fahrenheit—no higher—and allowed to remain without massage or manipulation until well thawed. Infection must be guarded against carefully after thawing as the tissue vitality is very low and the danger of infection is markedly increased.

When breathing has stopped artificial respiration should be used. When circulation has been reestablished to all parts of the skin, the temperature of the room can be gradually increased to normal room temperature (72 degrees F.). Wrapping the patient loosely in clean sheets and using gradually increased temperatures of water sprinkled on the sheets serves as a satisfactory method where room temperatures cannot be controlled readily. In either case all clothing should be removed from the patient.

Poisoning. Poisoning is the effect produced by the action of poisons on the body, either internally or externally. Poisons are substances either in the form of liquid, solid, or vapor, which by their physiological action are injurious or destructive to life. They may be divided into two general classes:

Corrosive poisons.

Produce burns (corrosive action) whether taken internally or applied externally.

Most common are the caustic acids and alkalies.

Non-corrosive poisons. Produce their effect by:

Physiological action on the nervous system either stimulating or depressing the medullary centers, or affinity for the nerve tissue.

Primary effect on the gastro-intestinal tract, causing irritation, inflammation, and swelling of the alimentary tissues.

NOTE. Some poisons such as phenol and phosphorous may produce corrosive action and also produce a general effect on the body, whether taken internally or applied externally, if in sufficient amounts.

Treatment of poisoning. There are few conditions which require more prompt action and where the effects of first aid may be more life saving than poisoning. The treatment,

providing there is no evidence of caustic action, consists of giving an emetic (produces vomiting) or using a stomach tube, the administration of a cathartic, and the use of an antidote. A specific antidote should be used if the poison taken is known; otherwise administer a general antidote which will neutralize the majority of poisons. The destructive result of the poison before it was neutralized is then treated, whether it be local, general, or both.

If there is evidence of caustic action, such as burned lips or tongue, do not give an emetic. Administer instead soothing oils, such as olive oil, cotton-seed oil, castor oil, and milk, internally. Give the proper antidote, if known. If an emetic is given to a patient suffering from corrosive poisoning the burned areas might rupture during vomiting. Since the poison is corrosive it would burn on the way up as well as down, thereby increasing the degree and extent of corrosive injury. If the proper antidote is not known, raw eggs and milk, flour and water, or hot strong tea, serve as antidotes. They also produce least irritation to the stomach mucosa and do not invoke vomiting.

General antidote. A general antidote is one that is given in cases where the nature of the poison is not known. However, it should be determined whether corrosive action has occurred. Tannic acid (which is abundant in tea) is a precipitant of alkaloids and therefore antidotal to most of the vegetable poisons. Albumin which is found in eggs and milk is antidotal to mineral poisons.

Special antidotes. Special antidotes are used to counteract certain specific poisons. For example: hydrated oxide of iron for arsenic poisoning, salt for nitrate of silver, magnesium sulphate (Epsom salts) for phenol and sugar of lead, copper sulphate for phosphorus, and potassium permanganate for opium.

Emetics. An emetic is a substance which induces vomiting. Useful emetics are: mustard, ipecac, tartar emetic, zinc sulphate, or salt in hot water. The finger stuck down the throat may induce vomiting. Do not use an emetic or stomach pump in case of corrosive poisons.

Common poisons and their antidotes. Some poisons are encountered more frequently than others. A few of these are listed with a brief description of antidotes and treatment, many of which, it is realized, will be unavailable for first aid treatment.

Acids, mineral. Give solutions of sodium carbonate, magnesium oxide, lime water, chalk, plaster from the wall mixed with water, starch, milk, white of egg, or oil. Use no stomach pump.

Acid, carbolic (phenol). Stomach tube or emetic, alkaline liquids, white of egg, Sodium sulphate or other soluble sulphates to hasten elimination from the circulation, warmth, and stimulants.

Acid, hydrocyanic. Empty stomach, flush stomach with hydrogen peroxide, inject 1.0 c.c. hydrogen peroxide solution subcutaneously every 5 to 10 minutes until circulation improves, cold water on chest and inhalations of ammonia for respiration, atropine hypodermically and aromatic spirits of ammonia for circulation, artificial respiration, and fresh air.

Aconite. Wash stomach or give emetic, tannic acid by mouth, stimulate heart, atropine subcutaneously, fresh air, artificial respiration.

Alcohol, ethyl. Stomach lavage, or emetic, strong coffee, keep body warm and head cold, aromatic spirits of ammonia and ammonia to nose for respiration, and artificial respiration.

Alcohol, methyl (wood alcohol). Follow above. Also give pilocarpine hydrochloride $\frac{1}{8}$ - $\frac{1}{2}$ grain, rectal injections salt solution, hot coffee, warm baths then cold effusions.

Alkalies. Do not use stomach tube. Emetics—Copious drinks, tepid water, vinegar and water, orange or lemon juice, olive oil, whites of eggs, barley water, gruel, milk or linseed tea.

Arsenic. Stomach lavage, official arsenic antidote (ferri hydroxidum cum magnesi oxide), oil, gruel, starch, mucilages, eggs, relieve pain with morphine.

Belladonna (atropine). Stomach lavage or emetic, tannic acid, $\frac{1}{2}$ grain pilocarpine, relieve pain, give stimulants.

Carbon monoxide. Artificial respiration in fresh air. Aerate the lungs as soon and completely as possible.

Chloral hydrate ("knock out drops"). Empty stomach at once, 5 to 10 grain doses of citrated caffeine, stimulate heart, keep awake, artificial respiration in event of respiratory failure.

Chloroform. If swallowed evacuate stomach, stimulate circulation, adrenalin into the heart if it has ceased to beat, hot and cold douches, and artificial respiration.

Cocaine. Evacuate stomach, strong tea, inhalations of amyl nitrite, morphine for excitement, oxygen for asphxia, artificial respiration.

Iodine. Wash out stomach, abundance of *boiled starch*, sodium thiosulphate, 20 grains. relieve pain.

Lead compounds. Empty stomach, magnesium sulphate, milk and other demulcent drinks, morphine for pain.

Mercury and copper compounds. Empty stomach, white of eggs, milk or chopped raw meats, potassium iodide 10 to 20 grains, every 2 to 3 hours, relieve pain, fresh water. For *copper salts* give pure potassium ferrocyanide 15 grains in glass of water.

Mushrooms. Stomach tube, or emetics, castor oil and copious enemas, atropine hypodermically, stimulate, keep warm.

Opium and its derivatives. Siphon out stomach and wash stomach with potassium permanganate solution, tannic acid, administer strong *coffee*, *caffeine* and *atropine* as physiological antidotes, keep awake, artificial respiration if breathing fails.

Phosphorus. (Ratpoison and matches). Lavage stomach, wash stomach with water containing 4 c.c. of oil turpentine; charcoal or lime water, magnesium sulphate. *Do not give fat or oil.*

Pilocarpine. Wash stomach or give emetic, tannic acid, *atropine* as physiological antidote.

Silver compounds. Wash stomach with *salt water*, give salt solution, white of egg, or milk, relieve pain.

Strychnine. Use stomach tube or emetic if time permits, *control convulsions at once with chloroform or ether* followed by chloral hydrate, morphine, or bromides. Give tannic acid by mouth.

Veronal. Wash stomach with tannic acid solutions, castor oil, enemas, hot and cold douches, stimulate heart, morphine for excitement during recovery.

FOREIGN BODIES

In the Eye. Search the corners of the eye with a good light; foreign bodies over the pupil are hard to see. Evert the lower lid and examine it; evert upper lid (Plate 55) and examine. Foreign bodies may be removed by a cotton swab on a match stick. Never rub an eye having a foreign body in it.

If the eye has been splashed with an acid, flush it with an alkaline solution such as soda water or lime water. If splashed with an alkali, use an acid solution such as diluted vinegar or lemon juice.

In the Ear. Foreign bodies in the ear are usually insects, cinders, or vegetable matter. If a live insect enters the ear, hold a light near the ear, which will often cause the insect to come out. If not, lay the head on the opposite side and pour a few drops of light oil into the ear. This may kill the insect and float it out. An insect or cinder may be flushed out with water. Never use liquid to flush out vegetable matter, as this may cause it to swell to a larger size.

In the Nose. Foreign bodies in the nose are easily expelled by closing the mouth and the other nostril and forcefully expelling air through the affected nostril. If the object is not vegetable matter the nostril may be syringed with warm water, which will often wash the foreign body out. If none of these methods are effectual the foreign body may be gently pushed back through the nose into the nasopharynx and recovered through the mouth.

In the Throat and Larynx. Foreign bodies in the throat and larynx may be very

serious. If they completely cut off the air, asphyxia will result in a very short time. Attempt to dislodge the particle by making the patient cough and slapping him on the back between the shoulder blades. A child should be dangled by its heels and shaken in



Plate 55. Removal of Foreign Bodies From the Eye.

an effort to dislodge the foreign body. Frequently the object may be reached by passing a finger down the throat. If none of these treatments are of avail an emergency tracheotomy may be necessary.



CHAPTER VII

MEDICAL ASPECTS OF CHEMICAL WARFARE

This chapter contains basic information on chemical agents, their behavior on the human body, the recommended first aid care and medical treatment of chemical injuries.

Chemical warfare is used because of the effects that it is able to produce on the enemy personnel and animals. When gas casualties occur, they are produced in large numbers. This is particularly true if the agents are used in high concentrations with an element of surprise, against ill equipped and poorly trained troops.

The term "gas" as used in warfare is used in a very general sense, including any chemical substance, solid, liquid, or true gas, which is employed for its poisonous, irritant or vesicant effect on the body. In general these substances are dispersed into the air as vapors or as poisonous smokes which make the air dangerous to breathe. Some of the agents, particularly the vesicant agents, will exert their vesicant effects on any portion of the body with which they come into contact in either the liquid or vapor form.

A report from the British West Riding Casualty Clearing Station, which admitted 248 gas casualties in World War I, states: "The majority of cases of gas poisoning received at this hospital showed no sign of that condition." Medical officers often had difficulty in determining whether they were dealing with men suffering from gas poisoning or not. This should stimulate all of us to make every effort to learn as much as possible about the gas casualty. For the tactical employment of chemical warfare agents and the measures of defense which are used to reduce their effectiveness see Chapter IX, Part I.

CLASSIFICATIONS

Several different classifications of chemical agents are possible according to the particular characteristics considered. The three main systems of classification are those according to:

1. Physiological action
2. Persistency
3. Tactical use

These three systems overlap at points in that a single agent may appear in more than one place in a single classification. However, the physiological classification is the one we are principally interested in from a medical standpoint.

Physiological Classification:

Lung Irritant. An agent which, when inhaled, causes irritation and damage of the respiratory tract. Example: Phosgene.

Vesicant. An agent which, on contact with the skin, produces erythema, blistering or necrosis of the skin. Example: Mustard.

Lacrimator. An agent having its most pronounced action on the eyes, causing a copious flow of tears and intense, though temporary, eye pain. Example: Chloracetophenone.

Irritant Smoke or Sternutator. An agent usually disseminated as an extremely fine smoke or dust, and which when inhaled causes intolerable sneezing, coughing, lacrimation, headache, and nausea, all these effects adding up to produce temporary physical prostration. Example: Diphenylaminechlorarsine (Adamsite).

Systemic Poison. An agent which, on absorption into the blood stream, directly interferes with physiological processes, such as utilization of oxygen by the body. Example: Hydrocyanic acid.

An agent may act on the body in more than one way: *i.e.*, Mustard vapor when inhaled is a lung irritant and when in contact with the skin is a vesicant agent,

Physiologically, the chemical agents are classified as:

1. *Lung Irritants.*
 - a. Chlorine—Cl
 - b. Phosgene—CG
 - c. Chlorpicrin—PS
2. *Vesicants.*
 - a. Mustard—HS
 - b. Lewisite—M₁
 - c. Ethyldichlorarsine—ED
3. *Lacrimators.*
 - a. Chloracetophenone—CN
 - b. Chloracetophenone solution—CNS
 - c. Chloracetophenone solution—CNB

NOTE: In addition to the chloracetophenone, the British symbol of which is CAP, the British use two other lacrimators:

(1) *Ethylodacetate* (symbol—KSK). This is a dark brown, oily liquid with an odor resembling that of amylacetate (Banana oil).

(2) *Brombenzylcyanide* (symbol—BBC). As employed in war, BBC is a heavy, oily, yellow liquid with a penetrating bitter-sweet odor, which is fairly persistent.

4. *Irritant Smokes.*
 - a. Adamsite—DM—Diphenylaminechlorarsine
 - b. Sneez gas—DA—Diphenylchlorarsine
5. *Systemic Poisons.*
 - a. Hydrocyanic Acid—NCN
 - b. Arsine—As H₃
 - c. Hydrogen Sulfide—H₂S
 - d. Carbon Monoxide—CO

Classification by Persistency. The length of time an agent will maintain an effective concentration in the air at the point of release is called the persistency of that agent.

1. *Persistent agent:* An agent which, under favorable conditions, produces concentrations against which protection is required for longer than 10 minutes. Example: Mustard.

2. *Non-persistent agent:* An agent against which, under the above conditions, no protection is required after 10 minutes. Example: Phosgene.

Classification by Tactical Use. *a. Casualty agent.* An agent which, in the commonly used concentrations, will produce casualties among enemy personnel. Example: Mustard.

b. Harassing agent: An agent used to force the enemy to wear masks or take other protective measures which interfere with his normal activities. Example: Irritant smokes.

c. Screening agent: An agent which produces a dense obscuring smoke, in air, thus reducing visibility in combat. Example: White phosphorus.

d. Incendiary: An agent which upon ignition generates sufficient heat to ignite combustible material with which it comes in contact. While primarily used to destroy material, incendiary agents will cause casualties among troops hit by the burning agent. Example: Thermit.

In the treatment of casualties resulting from exposure to chemical agents, we should realize that gas poisoning, whatever the chemical agent used, usually does not permanently poison the patient or chronically impair his health. It is necessary to insist on this throughout lest the patient be allowed to develop a morbid trend and drift into neurasthenia and general debility.

It is also of utmost importance that medical officers apply to themselves and to their men all possible means of protection—individual, collective and tactical—in order that they do not become contaminated and thereby become casualties. This is particularly true when dealing with an agent like mustard gas, for in low concentrations this agent has the property of desensitizing the olfactory nerves and, as a result, one could remain in this low concentration for an extended period of time and not realize its presence, and become a casualty through the cumulative action of the agent.

LUNG IRRITANTS

Practically all chemical agents act as lung irritants under some conditions, but with *chlorine*, *chlorpicrin*, and *phosgene* this power to produce lung irritation under field conditions is their main characteristic. A latent period of reaction of from 1 to 12 hours or more may intervene between exposure and onset of symptoms. This is not true with high concentrations of chlorine, which may cause instantaneous death. The general knowledge that a latent period exists may lead to malingering and will tax the diagnostic ability of the surgeon. *The fact that a cigarette is unpalatable during the latent period helps to detect malingering.* However, suspected lung irritant cases must be given the benefit of the doubt and a 24 hour observation period is the usual procedure.

These agents cause irritation and damage to the respiratory passages with resulting inflammation and devitalization of the air cells in the pulmonary alveoli. The inflammatory process spreads to all the lung tissues and causes a pouring out of fluid from the pulmonary circulation. This condition results in "pulmonary edema," which interferes with the air cells making the proper interchange of oxygen and carbon dioxide, and contributes to the development of an anoxemia. The edema is entirely different from that which we see in cardiac decompensation for instance, because here there is chemical damage to the tissues lining the alveoli, and chemical damage to the blood vessels. Multiple thrombi in the lung and increased viscosity of the blood both interfere with pulmonary circulation and add to the anoxemia. The increased resistance to the pulmonary circulation plus anoxia of the cardiac muscle leads to cardiac failure. Initially the load is thrown on the right side of the heart and later there is a general cardiac collapse. Respiratory embarrassment becomes more and more evident as the fluid accumulates in the alveoli and finally in the air passages. Asphyxiation results. The man actually drowns in his own fluids.

All of these agents are much alike, all contain chlorine, but the big difference is that they attack different levels or parts of the respiratory tract. It is most improbable that chlorine will ever be used in the field again.

PHOSGENE—CG.

Physical Properties. At low temperature phosgene is a clear, colorless liquid, which in warm weather will form a gas or vapor under field conditions.

The vapor density of phosgene as compared to air is 3.4. Due to this high vapor density a phosgene cloud will hug the ground until it is much diluted with air, unless it is carried upwards by convection currents.

Persistency. Since phosgene is a gas under ordinary summer conditions, it will have practically no persistence and will disappear from any given locality as fast as the wind blows in that particular place. In cold winter weather when it is in the liquid form, if sprayed or splashed on the ground, it will have a slightly greater persistency than in warm weather, but even in winter its persistency will range between one and ten minutes.

Tactical Use. Phosgene is used tactically to produce casualties. It may be utilized up to within thirty minutes of the time friendly troops expect to occupy the target area.

Detection. Phosgene is best detected by means of its odor which is strong and unmistakably and is variously described as being like insilage, new mown hay or cut corn.

Protection. The service gas mask affords complete protection against phosgene.

Pathology. The delayed reaction of this agent is outstanding, even relatively high concentrations may be breathed without irritation of the respiratory passages, thus allowing the gas to come in contact with the most distant bronchioles and alveoli of the lungs. Phosgene is extremely toxic and has a cumulative effect even in low concentrations. The severe pulmonary edema which ensues on inhalation is caused by hydrolysis of the gas to produce carbon dioxide and release hydrochloric acid. The acid is most irritating, increasing the permeability of the alveolar and capillary walls and causing pulmonary edema. The loss of edema fluid leads to hemoconcentration and marked increase in the viscosity of the blood. Pulmonary thrombosis is common. These factors throw a tre-

mendous load on the right heart, cause a decrease in the oxygen content of the blood and an accumulation of carbon dioxide. This is the characteristic *blue stage* of asphyxia. The blue color results from the oxygen lack and is manifested by vaso-dilation of the superficial capillaries due to the accumulation of carbon dioxide.

The pulmonary edema progresses and the carbon dioxide, being more soluble in the waterlogged tissues than is oxygen, passes out of the blood stream into the edema fluid. The patient then lacks the natural stimulus to the respiratory center or an acapnia develops. He is unable to breathe deeply or even make a fight to maintain his own breathing. (J. S. Haldane.)

The cardiac muscle becomes more and more anoxic and general cardiac failure results. The decrease of carbon dioxide in the blood allows a constriction of the superficial capillary vessels and the patient assumes the grey color characteristic of the "grey type asphyxia."

Another explanation of the pathology in the grey stage is that there is no decrease in the carbon dioxide content of the blood but the respiratory center, due to over stimulation, becomes resistant and fails to respond. As the patient goes into shock there is a splanchnic dilation and the blood leaves the superficial vessels and goes to the deeper circulation accounting for the change of color of the skin.

Symptoms. During the latent period of 12 to 24 hours the patient is absolutely symptomless. You will have difficulty in convincing him that he has been gassed and that *absolute rest is imperative*. The pulmonary edema develops suddenly and dramatically, or it may come on gradually. The usual chain of symptoms is redness of the eyes, flushing of the face, increased respiratory rate but inability to breathe deeply, and occasionally a slight cough. The cough is uncommon because there is slight irritation to the upper respiratory tract. Physical examination of the chest will be negative during the latent period. In the more severe cases, as the symptoms progress the patient attempts to cough up the bloody, frothy sputum, and the face takes on a deep cyanosis with increased engorgement of the veins of the neck. Even at this stage chest examination may be negative. We do sometimes find an increased percussion note; intensified breath sounds, and vocal fremitus; fine rales may be heard over the back and sides and in the axillae; and rough ronchi over the upper chest.

The patient may suddenly or gradually go into the grey type of asphyxia, developing general cardiac failure, with fall in blood pressure, collapse of veins of the neck, and cold clammy skin, with a greyish leaden hue, usually associated with an accumulation of fluid in the respiratory tract. Occasionally the blue stage is so transitory that it will pass unrecognized and the patient go directly into the grey stage.

Diagnosis. Diagnosis is based upon history of exposure and the onset of the symptoms as described above.

First Aid. First aid is the insistence on absolute rest for the phosgene case and general measures to prevent shock. The medical officer makes his recommendation and the commanding officer decides whether he can comply with that recommendation.

Medical Treatment. *Complete rest* is imperative. Apply heat by blankets, extra coats, and hot drinks. Venesection (bleeding) is indicated in the blue cases, and oxygen should be given when it is available. Even when these patients become restless or apprehensive it has been found that they do badly on alcohol or morphine. Morphine should *never* be given to the phosgene case. This dictum is based on experience in the First World War Barbiturates in small, guarded dosage may be used.

Venesection is universally beneficial during the blue stage. First, it helps to decrease the number of alveolar and capillary thrombi. Second, because of the pulmonary circulatory resistance and increased viscosity of the blood, bleeding helps to relieve the load on the right side of the heart. Third, the total amount of carbon dioxide in the blood stream is decreased. 400 to 600 c.c. of blood should be withdrawn as early as possible, and another 500 c.c. may be removed 6 hours later and the procedure may be repeated later if necessary. *Venesection should never be used in the grey or collapse stage.*

It would seem logical at first glance that because of the marked increase in the viscosity of the blood that some type of dilution such as intravenous plasma, gum acacia,

hypertonic glucose, pectin would be indicated. Whole blood transfusions or saline might seem to be indicated. It would seem that the osmotic pull exerted by most of these substances would decrease the amount of fluid in the lungs. Such is not the case. If we will remember that the chemical damage to the alveolar and capillary walls is still present, then we will realize that putting more fluid into the blood stream will only furnish more blood to leak through into the lung tissue and increase the pulmonary edema. Experimentally it has been proved that intravenous fluids such as plasma, pour right through the damaged walls of the capillaries because of their increased permeability, and can be recovered quantitatively from the alveoli. *Intravenous fluids are contraindicated.*

Cardiac stimulants, such as digitalis, caffeine, and coramine are of little or no value in combating the cardiac failure. It is much like flogging a horse bogged down under a heavy load and already doing all that he can. Oxygen will relieve the cardiac muscle anoxia and venesection will relieve the load on the heart.

Oxygen. We can never say when or where oxygen will be available for field use because of the weight of the oxygen cylinders and problem of transporting them, but when it is available it can be used to great advantage once the pulmonary edema and anoxemia develop, because of the interference of the gaseous exchange in the lungs. Clinical experience has shown that there is no advantage to using oxygen-helium mixture, since there is no bronchial spasm or occlusion. Also, oxygen-carbon-dioxide mixture is said to have no advantage over plain oxygen. The administration of oxygen by using the efficient nasal mask for 3 or 4 minutes out of every 15 will suffice as a rule. Treatment must be continued night and day as long as cyanosis lasts. The nasal catheter or funnel may be used when nothing better is available. An efficient method of administration used in France during World War I was the employment of oxygen balloons. These were oblong balloons made of rubber much like the texture of the gas bag on a modern anesthetic machine. They had a short tube attached with a flanged opening at the loose end, so that it could be held in the mouth by the patient. The balloon was sealed by means of a clamp on the rubber tube opening that was readily released. The nose of the patient was clamped, the mouthpiece placed in his mouth, and the operator forced oxygen into the lungs by pressure on the balloon when administering to a casualty in the *grey stage*. Artificial respiration was thus simulated by applying and releasing pressure on the oxygen balloon.

5. Artificial respiration as we ordinarily think of it, *i.e.*, by applying and releasing pressure on the thoracic cage, is *contraindicated*.

Prognosis. The prognosis should always be guarded because of the insidious nature of the poisoning. The milder cases recover without sequelae. 80% of the deaths occur during the first 48 hours after exposure. If the casualty lives through this critical period he will usually survive. When death does occur after some days, it is due largely to broncho-pneumonia. Occasionally chronic pulmonary diseases, such as bronchitis or bronchiectasis are sequelae of phosgene poisoning. Statistics on follow-up studies of World War I cases lead us to believe that pulmonary tuberculosis never results from this gas, although psychosomatic pulmonary complaints often continue for years. The prognosis is much more grave for the grey or pallid cases than for the blue cases.

CHLORPICRIN—PS

Physical Properties. Chlorpicrin in the pure state is a colorless, oily liquid; the plant run product has a faint yellow color. It is practically immiscible with water which makes separation easy. It is not decomposed by water.

Persistence. Chlorpicrin is more persistent but less toxic than phosgene, and is therefore classified as a moderately persistent lung irritant. Its greatest advantage lies in its great chemical stability which makes it much more difficult to protect against than many other agents. In the summer it will persist one hour in the open and four hours in the woods, while in winter, twelve hours in the open and one week in the woods.

Tactical Use. To produce casualties.

Detection. Like phosgene, chlorpicrin is best detected by the odor which is described

as a sweetish odor somewhat resembling the odor of flypaper. Often chlorpicrin will be detected by its lacrimatory effect before it is detected by the odor.

Protection. The service gas mask gives complete protection against chlorpicrin.

Pathology. Chlorpicrin attacks the lung tissue in a manner similar to the action described for phosgene, although the pulmonary edema is less severe and pulmonary thrombi are less common. Like chlorine, and contrary to phosgene, chlorpicrin attacks the air passages. This causes edema of the epithelial lining of the bronchi and plugging of their lumina with a resultant pulmonary emphysema. Kidney damage and nephritis may be present.

Symptoms. The symptoms are similar to those from phosgene except that there is more irritation of the respiratory tract, coughing, lacrimation, nausea and vomiting are more common. In fact this agent is sometimes referred to as the "vomiting gas."

Diagnosis. Diagnosis is based on a history of exposure, odor of flypaper on clothing, lacrimation, respiratory tract irritation, and pronounced nausea and vomiting.

First Aid. The therapy is the same as for phosgene.

Medical Treatment. The same as for phosgene.

Prognosis. Sudden death is much rarer than from chlorine and the outcome is determined by the severity of the pulmonary edema present. Sequelae, such as chronic bronchitis and emphysema, may occasionally follow poisoning by chlorpicrin.

CHLORINE—CL

Physical Properties. Chlorine is a heavy greenish-yellow gas having a disagreeable chlorine odor and a powerful irritating effect upon the membranes of the nose and throat. It is one of the few truly chemical warfare gases. Most of the others are either liquid or solid at ordinary room temperatures. It is slightly soluble in water.

Persistency. Vaporizes almost immediately under field conditions. Drifts as gas with the wind but, being heavier than air, clings for some time in trenches, shell holes, woods and other low or protected places.

Tactical Use. It is used as a casualty producing agent but, because it is so easy to protect against chlorine, it probably will not be used again in the field.

Detection. Chlorine is detected by its characteristic pungent odor.

Protection. The service gas mask.

Pathology. It is characteristic of chlorine to attack the epithelial lining of the upper respiratory tract, *i.e.*, naso-pharynx, trachea and bronchi. It also attacks the eyes. It may cause considerable damage, even extensive necrosis to the mucous membrane, but the damage to the lung tissue itself and the resultant pulmonary edema are relatively less than from chlorpicrin or phosgene. Since chlorine is more irritating to the air passages and more soluble in the moisture there, spasm of the walls of the respiratory tract is commoner.

Symptoms. When high concentrations of chlorine are inhaled there is *no latent period* as with the other lung irritants. Severe symptoms will be manifested immediately. Chlorine causes a stinging sensation of the eyes and lacrimation. There is a burning sensation in the throat, paroxysmal coughing and a feeling of suffocation. When lower concentrations are inhaled pulmonary edema supervenes (in a shorter time than from phosgene), sometimes as soon as 20 minutes after exposure.

Diagnosis. 1. History of exposure.

2. Odor of chlorine

3. Irritation of eyes

4. Irritation of respiratory tract

5. Choking paroxysmal cough

6. Pulmonary edema

7. Persistent bronchitis

First Aid. Same as for phosgene.

Medical Treatment. The same in all respects as phosgene.

Prognosis. Sudden death may result from high concentrations. Prognosis is poor when pulmonary edema develops. Persistent pulmonary emphysema and chronic bronchitis are frequent sequelae.

VESICANT AGENTS

At the outbreak of World War I, over seventy vesicant compounds were known to science, yet only five were actually identified with the war. Of these but two, *mustard* and *ethyldichlorarsine*, were actually used while the other three, *lewisite*, *methyldichlorarsine*, *dibromethylsulphide*, were in the process of investigation or manufacture at the end of the war and were not actually used in battle. Mustard gas was used widely by both sides and proved to be so effective that it became the principal battle gas of the last year of the war. The vesicants are very soluble in the substance of animal



N. E. A.

Plate 1. A Chinese Casualty Caused by Gas That Was Laid by the Japanese.

tissue, have weaker chemical affinities for living matter than the lung irritants; therefore, they disintegrate more slowly and penetrate further into the tissues of the body, thus greatly enlarging their field of action.

The vesicants are employed primarily for their action on the skin, although they also cause irritation to the eyes, respiratory tract and lungs. There are two types of

vesicant agents, *i.e.*, those that cause surface irritation (mustard) and those that cause surface irritation plus internal poisoning. These latter are the arsenicals, lewisite and ethyldichlorarsine.

Lewisite was first isolated and described by Professor Lewis of Northwestern University, Evanston, Illinois. Although never manufactured in large quantities nor used during World War I, it has been used by the Japanese against the Chinese in the present conflict. (See Plate 1.)



British Chemical Warfare Service.

Plate 2. A Severe Mustard Burn Showing the "Doughnut" Shaped Lesion.

MUSTARD—HS

Physical Properties. Mustard is a heavy, oily liquid, the plant run product is dark and evaporates slowly. At ordinary temperatures high concentrations are not usually obtained by vaporation from the ground. Vaporation is hastened by airplane sprays and the explosion of shells containing liquid mustard. Mustard is practically insoluble in water, but is soluble in hydrocarbons and most organic solvents (gasoline, kerosene, carbon tetrachloride, carbon disulphide and even lubricating oil). In water the soluble fraction rapidly hydrolyzes into non-toxic substances, producing hydrochloric and thiodiglycol. Mustard is readily dissolved by rubber.

Persistence. Summer—four to five days in the open, one week in the woods; winter—several weeks both in the open and in the woods.

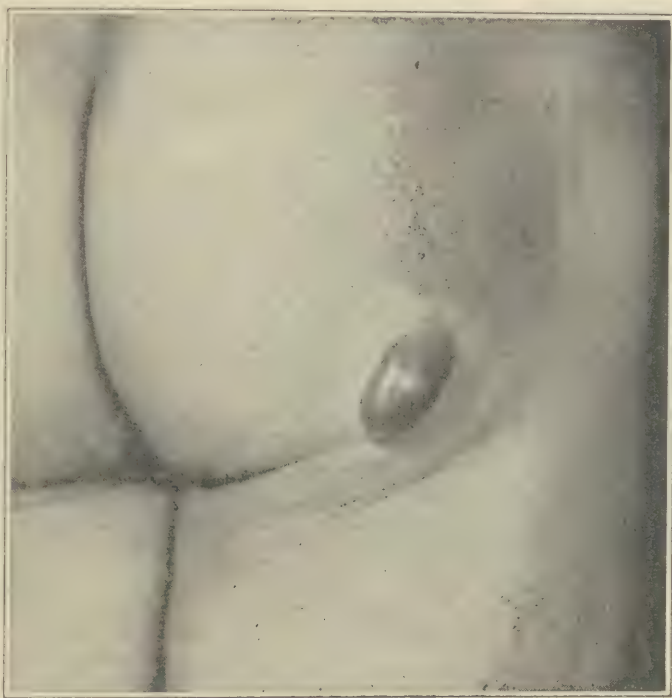
Tactical Use. To neutralize areas, to produce casualties, and to deny ground through threat of casualties.

Mustard is best disseminated by means of a small caliber artillery shell; by searching fire so as to produce the greatest possible number of contaminated spots. This also presents a greater surface for vaporation to take place from, and therefore high concentrations of the vapor are obtainable in the air. Due to the high persistency, is it not necessary to use this gas on occupied targets, but it may be utilized to deny ground through threat of casualties.

Detection. Mustard gas is best detected by means of its odor in low concentrations. The odor is usually described as being like garlic, horseradish, or onions. In high concentration it is decidedly pungent and irritating. (Caution: In low concentration, mustard gas will desensitize the olfactory nerves so that one can remain in the contaminated area without realizing the danger.)

Protection. The gas mask is required for the protection of the face, eyes, and respiratory tract. Protective clothing and ointment are necessary for the rest of the body.

Pathology. When mustard in a liquid or vapor form comes in contact with the skin or mucous membrane it causes irritation and burning. It will attack the conjunctiva of the eyes and may attack the mucous membrane lining the respiratory tract, in which case the greatest destruction is caused to the upper respiratory tract, *i.e.*, the nose, mouth, larynx, trachea and bronchi. In addition mustard does have lung irritant properties. There is edema of the epithelial lining of the bronchioles that leads to partial or complete obliteration of the lumina and eventually to a desquamation of the bronchiolar epithelium. This destruction is patchy in arrangement and not generalized throughout the lung. Pulmonary edema and emphysematous changes are seen in microscopic examination of the lung tissue, but this likewise is a patchy arrangement and not generalized. Mustardized victims do not suffer the respiratory suffocation that we see in the phosgene patient, and when death occurs from mustard, *it is due to a secondary infection and the development of bronchopneumonia*, not directly to the mustard gas. There is an initial



British Chemical Warfare Service.

Plate 3. A Mustard Burn Showing Large Singular Blister, Surrounded by an Area of Erythema.

leukocytosis and, although mustard is not generally thought to have a systemic reaction, we know that it attacks the bone marrow to some extent after two or three days and causes a leukopenia. The abundance of necrotic tissue in the wound and lack of adequate blood supply form a good culture media for bacterial infection. All of these factors, together with the easily accessible portal of entry for the organisms, may explain why they are so difficult to combat. If there is sufficient tissue destruction within the lungs, chronic bronchiectasis or even lung abscess may result, although this is certainly the exception rather than the rule.

As to the skin vesication that takes place, it is undetermined whether it is due mainly to a specific effect on certain enzymes or a general effect on the structural elements of the tissues. We know that vesicants in general have a powerful inhibitory effect on carbohydrate metabolism. It is now believed that mustard acts as a whole molecule in causing the destruction of the skin and not by forming hydrochloric acid or because of the sulphur element present.

Mustard is highly soluble in lipoids and penetrates the skin along the hair follicles and in the sebaceous glands. The mustard molecule causes an irritation of the skin and capillaries in the affected area that results in a hypermia or redness. There is a loss of plasma through the injured walls of the capillaries that results in local edema. When only a vapor burn is sustained this may be so far as the pathological process goes, but if liquid or droplets of mustard are present the plasma continues to escape from the injured capillaries, the edema increases, and the skin in the center of the area becomes very tight and the casualty becomes aware of the burn because of the onset of pain. The local loss of fluid becomes so great that there is a separation of the epidermis from the dermis and blister formation. When a considerable quantity of the mustard is present there may be so much tissue damage in the center of the burned area that tissues cannot react and we have the characteristic doughnut-shaped lesion (See Plate 2), with the severely damaged, white, indurated tissue surrounded by the vesicle formation of the less damaged tissues. The other characteristic type of lesion from a lesser amount of mustard is large, singular, tense blisters filled with clear fluid and surrounded by an erythematous area of tissue reaction to an even smaller concentration of the agent. (See Plate 3.) In the severe burns, after blister formation, there is an actual death of the cells with necrosis and ulceration. Pyodermia or secondary skin infection is common. The damage that mustard gas causes to the pigmentation layer of the skin results in a brownish discoloration, giving it a blotchy appearance. This has sometimes lead to these patients being referred to as "Chemical Lepers."

Symptoms. In many instances the first effect noticed is the irritation and inflammation of the eyes and eyelids. Mustard, either vapor or liquid, is painful in the eyes after a lapse of a few hours, depending upon the concentration. It feels like a grain of sand and causes smarting and copious lacrimation. The eyeball becomes glazed over with the increased flow of tears and has the appearance of ground glass instead of being crystal clear. Photophobia and blepharospasm are present. Characteristically, we see a capillary injection of the sclera that is elliptical in outline, *i.e.*, it conforms to the shape of the palpebral fissure, because that is the portion of the eyeball first exposed. The agent is then spread over the eye by the movements of the eyelids, and the capillary injection becomes generalized over the sclera. Eventually a chemosis develops. Liquid burns are very serious and lead to ulceration and destruction of the cornea.

When the eyes have been protected by an eyeshield such as the British use, or the gas mask, the skin shows the first reaction, and that is a severe itching. The *insidious onset* of the skin reaction may be from one to six hours with liquid mustard and twelve or more hours with a vapor burn. In this delayed action mustard resembles a sunburn or an X-ray burn. The time reaction depends to some extent on the skin sensitivity of the individual. During the delay period a mustard burn is *absolutely painless*, but after the erythema and the edema set in due to tissue reaction, the mustard burn is *painful*. The blisters that form are large, single, tense blisters, containing fluid and surrounded by an area of redness; or we may see the characteristic doughnut-shaped blister previously described.

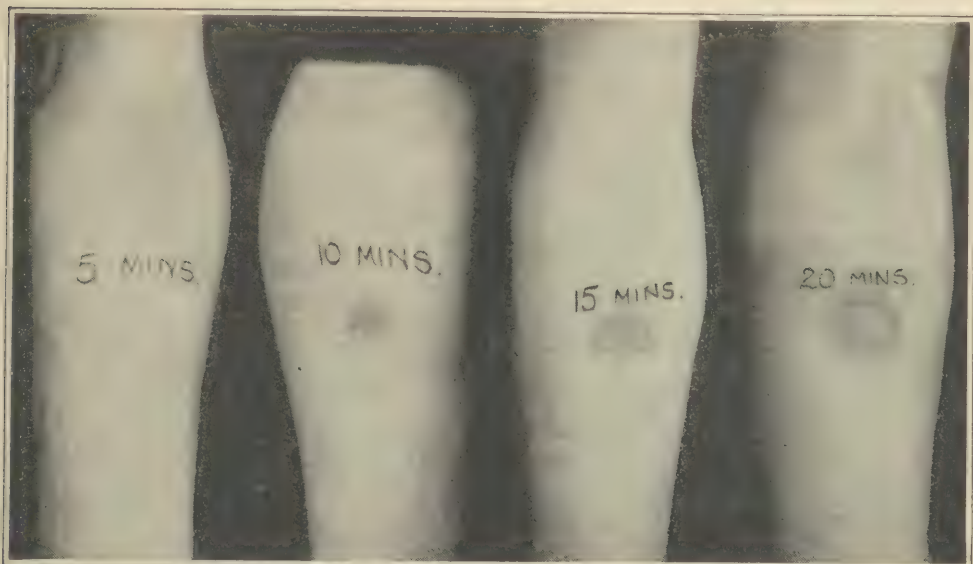
The moist areas of the body and those parts subjected to friction are usually the most severely burned from mustard vapor; these are the perineum, genitalia, axillae, elbows, knees and neck.

When mustard gets into the respiratory tract it causes sneezing, increased nasal secretion, and a hoarseness that is characteristic. Throat irritation, cough, nausea and pain in the epigastrium may develop later. Bronchopneumonia is a common complication.

Diagnosis. The essential factors upon which diagnosis is based are as follows:

1. History of exposure.
2. Mustard (horseradish, onion, or garlic) odor on skin or clothing.
3. Eyes—Irritation, pain and redness of the conjunctiva.
4. Nose—Irritation, redness of the mucous membrane, and increased nasal secretion.
5. Mouth and throat—hyperemia, hoarseness.
6. Skin:

- a. Delay reaction 2-12-24 hours after exposure.
 - b. Severe pruritis (itching).
 - c. No pain during insidious onset.
 - d. Erythema followed by blister.
 - e. Large, singular, tense blisters containing clear fluid, surrounded by area of erythema.
 - f. Large doughnut-shaped lesions.
 - g. Secondary pyoderma common.
 - h. Does not burn structures beneath the skin.
 - i. Pigmentation common.
7. Systemic: Tendency to attack bone marrow and white blood cells.
 8. Mustard rarely causes death and then only due to complications.



British Chemical Warfare Service

Plate 4. Showing the Time Element Involved in the Protection Given by Protective Ointment.

First Aid. We cannot emphasize strongly enough that *THE FIRST AID CARE OF THE VESICANT CASUALTY IS AN INDIVIDUAL PROPOSITION*. He should remove all of the free mustard by blotting the contaminated area with a cloth or first aid bandage. Each individual soldier must carry his own protective ointment and be thoroughly instructed as to the best method of applying it and, above all, the necessity for *immediate application*. (See Plate 4) If he waits until he can get to a medical officer the damage will have been irreparably done. When the clothing is contaminated it is desirable to remove it as soon as possible. Immediate removal of all the clothing is impracticable when the soldier must remain in the area. In that case the clothing would be left on as the resultant vapor burn would be less severe than a liquid burn from exposing the entire body to the agent. When small portions of the clothing are contaminated that portion of the clothing can be cut away and the underlying skin covered with protective ointment.

1. **Eyes:**

- a. Repeated or continuous irrigation of the eyes with plain water. The canteen cap can be used as an eye cup.
- b. The eyes must *not* be bandaged as the pressure may cause corneal irritation.
- c. The eyes should be protected from strong light.
- d. Protective ointment must *not* be used in the eyes or around the eyes.

2. *Skin lesions:*

The immediate application of protective ointment by rubbing it into the area, taking care not to spread the agent to uncontaminated areas. The ointment should then be wiped off and the procedure repeated two or three times. The protective materials, such as bleach solution or sodium hypochlorite (Dakins Solution), containing active chlorine should *not* be left on the skin for more than a few minutes. If protective ointment is not available an effective paste may be made by mixing 1 part bleach to 1 or 2 parts water. *Dry bleach* must not be used on a mustard burn as the heat generated will cause further injury.

Medical Treatment. The definitive treatment of injuries caused by chemical agents does not differ from that of similar conditions occurring from other causes, except that the chemical agent must be removed or neutralized as soon as possible. The after treatment of a burn from mustard is the same as the treatment of any other burn of like degree.

Eyes: Continuous irrigation, using 2% boric acid solution, 2% sodium bicarbonate, normal saline or plain water. 2% butyn may be used to relieve the pain. Shield the eyes from strong light but do *not* bandage them. Do *not* use borax, carbonate of soda or cocaine in the eyes. Cocaine causes corneal irritation, desquamation and ulceration. In severe conjunctival or corneal cases, when an iritis or keratitis is present a bland oil should be instilled, such as alkaline cod liver oil, castor oil with acriflavine or glycerin. Instill atropine ointment or 1% atropine solution every day until the symptoms of iritis subside. When the eye discharge becomes purulent 10% argyrol followed by boric acid solution should be used. One of the new sulfonamide ophthalmic ointments may be tried.

It is most important that we know whether the man has sustained a vapor burn of the eyes or a liquid burn of the eyes, because our treatment will be, in most cases, effective against vapor burns, but it will be much less effective against the liquid burns of the eyes. We must assure the man with a vapor burn that he is not going blind.

Skin: First, remove the excess mustard by blotting with dry pads, cloths, or waste. Second, sponge the area with a solvent such as alcohol, gasoline, kerosene, or benzine. Third, wash the skin area with soap and water. Fourth, apply a neutralizing agent, such as protective ointment, dischloramine "T," Dakins Solution, or bleach paste. These agents should be removed after 2 or 3 minutes.

If no excess mustard is present or if erythema is already present these steps are to be omitted. The burn would then be treated as a burn from any other cause.

The blister may be left intact and painted with amyl salicylate solution. This solution tends to dry the blister and form a protective covering for the area.

If a debridement is indicated the tannic acid treatment for ordinary burns is recommended for further treatment of these denuded areas. The tannic acid solution followed by 10% silver nitrate is also used to form an eschar. On flexor surfaces, where the tannic acid treatment is not applicable, triple dye solution or 1% gentian violet solution may be used. Cod liver oil ointment has its advocates, as do the new sulfonamide drugs, such as ointments, creams, sprays or powders. When the sulfadiazine, triethanolamine, methocel spray solution is used be on guard for a toxic dermatitis.

Prognosis. The prognosis is usually good. The vapor burns of the eyes rarely, if ever, cause blindness, while the liquid burns will cause a very high percentage of blindness. Vapor burns of the skin heal fairly rapidly, with no residual deformity.

The liquid burns of the skin are slow in healing and secondary infection is common.

The majority of deaths are from bronchopneumonia secondary to pulmonary irritation.

The long-range prognosis is good. Although many prolonged after effects have been blamed on mustard, actually these are the exception. Once a man is free from septic complications, he should be discharged from the hospital to a convalescent center, where a well-ordered routine of exercise, employment, amusement and rest will quickly restore him to a state of physical fitness. Medical officers with special aptitude will find these cases a fertile field for restoring morale and mental fitness.

LEWISITE—M-1

Physical Properties. The plant run product is a dark brown liquid. Lewisite is soluble in absolute alcohol, benzene, chlorine liquid, petrolatum, and many other organic solvents. It is practically insoluble in water but hydrolyzes readily with the formation of hydrochloric acid and a solid, toxic vesicant oxide (chlorvinylarsenious oxide). Since this hydrolysis produces a solid, vesicant, and toxic oxide, it does not evaporate and therefore contaminated areas remain dangerous for long periods of time. The water supply in an area contaminated with lewisite may be poisoned by the oxide regardless of its slight solubility in water.

Persistency. Lewisite is less persistent than mustard. Summer—twenty-four hours in the open, two to three days in the woods; winter—one week or more. The chief usefulness of this agent is under conditions that minimize hydrolysis, *i.e.*, cold weather and hot, dry areas. Lewisite vapor is more effective than mustard vapor in cold weather, but the reverse is true in damp or wet weather.

Tactical Use. To produce casualties. To deny ground thru threat of casualties.



British Chemical Warfare Service

Plate 5. A Lewisite Burn on the Hand.

Detection. Lewisite has a faint, somewhat unpleasant odor, at first resembling geraniums, then biting. Smelling it causes a very disagreeable burning sensation in the nose and throat and sometimes violent sneezing, often accompanied by nervous depression.

Protection. Service gas mask protects the face, eyes, and respiratory tract, but protective clothing and protective ointment will be required for the rest of the body.

Pathology. The pathology caused by lewisite is much like that described for mustard, except that the action is much more rapid. The reaction takes place in a matter of seconds—not after a delayed period. The lesions progress through the stages of erythema, vesiculation, necrosis and ulceration. The blisters tend to be smaller and more numerous than we see in mustard burns. (See Plate 5). There is no area of erythema surrounding the blisters and the fluid in the blisters is cloudy. The lewisite is rapidly absorbed into the skin and converted into a water soluble called “lewisite oxide.” In the first 24 hours the lewisite is carried by the red blood cells and later arsenic can be found in all the tissues of the body. It is excreted by the liver through the bile passage into the intestine and in the urine via the kidneys. Lewisite causes damage to the capillaries, increasing their permeability and permitting a leakage of plasma, giving rise to a condition resembling traumatic shock. Inhalation produces

ulceration of the upper respiratory tract, secondary anemia and occasionally bronchopneumonia. Because of the arsenical content the blister fluid is vesicant. Various toxic changes may be found in all the viscera, such as intense hemorrhagic necrosis of the lungs, liver and gall bladder. The tubules of the kidneys may become obstructed.

Symptoms. The onset of symptoms is much earlier and they are more severe than with mustard. There is irritation, pain and conjunctivitis, sneezing, nasal irritation and increased nasal secretion. Erythema of the skin develops within 15 to 30 minutes after exposure and the bullae next appear, reaching their peak in 12 hours, or less. They contain a cloudy fluid and there is no area of erythema surrounding the blisters. (see Plate 6). Lewisite burns are *painful* as contrasted with the mustard lesions. The symptoms of general arsenical poisoning appear when the agent is allowed to act untreated.

Diagnosis. 1. History of exposure.

2. Odor of geraniums, then biting.

3. Eyes—prompt irritation, pain, and lacrimation.

4. Nose—sharp burning sensation, sneezing and increased nasal secretion.

5. Skin:

a. Immediate reaction within 15 seconds.

b. Pruritis mild.

c. Rapid onset of severe pain.

d. Blister covers the area of erythema.

e. Blister fluid cloudy.

f. Secondary infection of blister uncommon.

g. Blister fluid is itself vesicant.

h. Burns through the skin into the muscle.

i. Pigmentation is less severe than in mustard burns.

6. Systemic: Attacks the red blood cells. May cause hemolytic anemia, liver degeneration and/or cellular debris in tubules of kidneys.

7. Result: Lewisite burns may result in death. 1 c.c. or 1/30 oz. on the skin will kill a man from the arsenic he would absorb.

8. Excretion: In bile and urine.

First Aid. *Eyes.* Continuous irrigation with water. It is true that lewisite oxide which is itself irritating will be formed, but the mechanical removal by continuous irrigation will remove that also and lewisite oxide is less irritating than undiluted lewisite. If each individual soldier has eye solution M1 it should be used immediately.

Skin. This is perhaps the most important phase of medical care of the casualty. Lewisite has an immediate action beginning in 15-30 seconds. For the protective ointment to be of any benefit it must be applied *within the first minute after exposure*. The protective ointment must be applied as described for mustard and 2 or 3 applications made.

Medical Treatment. *Eyes.* Same as described for mustard. It has been suggested that .5% hydrogen peroxide be used in the eyes. Hydrogen peroxide is itself irritating to the eyes and probably would do more harm than good.

Eye solution M1 is the treatment agent of choice when it is reasonably certain that lewisite is the contaminating agent. Eye solution M1 is used by dropping 2 to 4 drops of solution directly on the cornea of each eye and allowing it to remain. In case of blepharospasm the solution may have to be placed in the inner canthus and allowed to penetrate onto the cornea as best it may. The Eye Solution M1 is to be used once only and is *not to be repeated*. When eye solution M1 is not available, 2% sodium bicarbonate solution, normal saline or plain water may be used to irrigate the eyes. 2% butyn solution may be instilled to relieve pain and discomfort.

Skin. Mechanical removal as described for mustard. After the skin has been thoroughly washed with soap and water, all the blisters must be opened to prevent further absorption of the arsenic in the blister fluid. The skin surrounding the blisters should be protected by the application of vasoline because of vesicant properties of the blister fluid. The danger of systemic poisoning can be lessened by *prompt* application of 8% solution of hydrogen peroxide. The peroxide should be freely applied to the affected area with a swab for 2-3 minutes; and then a piece of gauze saturated with peroxide

should be left in close contact with the skin for 1-2 hours, or longer if possible. The contaminated clothing should be removed as soon as practicable. The after treatment of the burn is the same as any other burn.

When pulmonary irritation is present, sulfadiazine or sulfanilamide may be tried prophylactically or therapeutically to combat pneumonia; cardiac stimulants are used when indicated. Whole blood transfusions, liver extract and iron are indicated for the secondary anemia. Oxygen is useful to combat anoxemia. A high carbohydrate, high vitamin diet and adequate fluid intake and output help to combat arsenical poisoning.

Prognosis. Lewisite is more dangerous than mustard. Vapor or liquid burns of the eyes are both serious. Vapor burns or liquid burns of the skin are always dangerous because of the likelihood of a fatal arsenical intoxication when untreated. Liquid burns are slow healing because they are deeper than mustard burns. The whole thickness of skin and even the underlying muscle tissue may be destroyed so that skin regeneration is impossible and a plastic closure of the burned area becomes necessary. Bronchopneumonia is a dangerous sequel to lewisite inhalation.



British Chemical Warfare Service

Plate 6. The Difference Between Lewisite (Left) and Mustard (Right) Burns.

REMARKS: The possibility of the enemy using a mixture of mustard and lewisite must not be overlooked. The lesions of course would have the characteristics of lesions of both agents and the treatment would be a combination of the mustard and lewisite treatment.

ETHYDICHLORARSINE—ED

Physical Properties. ED is a colorless liquid that turns slightly yellow upon aging. It is soluble in alcohol, ether, ethylchloride, benzene, and acetone. It hydrolyzes slowly to form ethylarsenious oxide and hydrochloric acid (the hydrolysis product is toxic, if swallowed).

Persistence. Summer—one to two hours in the open, two to six hours in the woods; winter—two to four hours in the open, twelve hours in the woods.

Tactical Use. To produce casualties and act as a harassing agent.

Detection. The odor is vaguely described as being biting or irritant. (ED is difficult to classify according to its physiological action as it falls into three classifications. It acts as a lung irritant with a toxicity approximately equal to that of phosgene. It is also a power strenuator with about $1/5$ the irritant effect of difenelchorsine and it is also a moderately powerful vesicant agent with about $2/3$ the skin irritant power and $1/6$ the vesicant power of mustard.

Protection. The gas mask and protective clothing.

Pathology. Irritation of the eyes, nose, naso-pharynx, and lungs may occur. In fact any of the pathology described for lewisite may occur though vesication of the skin

is less than with lewisite or mustard. Arsenical involvement of the viscera occurs and post arsenical involvement of the nerve fibers are manifested. Paronychial swellings of the fingers is a common finding.

Symptoms. The eye symptoms are similar to those seen from lewisite. The irritation to the mucous membrane of the nose may be immediate or delayed; and the delayed reaction may cause the untrained person to believe that his gas mask is ineffective or leaking and cause him to remove it, thus getting a larger dose of the agent. Other symptoms are very similar to those described for lewisite, except that there is less vesication.

Diagnosis. Based upon the following factors:

1. History of exposure.
2. Pungent odor of skin and clothing.
3. Rapid onset of eye or respiratory tract symptoms.
4. Disappearance of respiratory irritation within an hour.
5. Blister formation similar to lewisite though less severe.
6. Presence of arsenic in blister fluid.

First Aid. Same as described for lewisite and it must be instituted *immediately*.

Medical Treatment. Same as described for lewisite. Inhalations of low concentrations of chlorine from bleach powder in a wide-mouthed bottle may relieve the respiratory symptoms.

Prognosis. This agent is less effective under field conditions than is lewisite. There are usually no serious complications from exposure to ordinary field concentrations. Neurological disturbances and arsenical poisoning may follow exposure to very high vapor concentrations or to the liquid.

Remarks. One final word on the vesicants. *DON'T GIVE UP ON THE TREATMENT.* Encourage the victim, fight infection, and arsenical poisoning, and be on guard for bronchopneumonia.

Vesication from any unrecognizable agent should be treated as a mustard burn until definitely identified.

LACRIMATORS

These agents, the tear gases, are mainly employed because of the irritation that they produce in the eyes. However, under ideal climatic conditions, especially hot, humid areas when the pores of the skin are opened, they will also cause irritation of the skin. Irritation of the face and neck after shaving are a common experience upon entering a gas chamber, as is irritation of the moist areas of the body, such as the wrists, axillae, groins and ankles. A few individuals show a hypersensitivity to these agents and develop a considerable dermatitis even when exposed to low concentrations.

CHLORACETOPHENONE—CN

Physical Properties. In the pure state CN is a white, crystalline solid that has the pleasant odor somewhat resembling that of locust blossoms. The plant run product looks very much like light brown sugar. It is insoluble in water but soluble in alcohol. It is soluble in benzene to the extent of 40%. It cannot be hydrolyzed by water nor readily destroyed. A hot aqueous solution of caustic soda or washing soda will slowly destroy it. The odor is detectable at low concentrations. It is a harassing agent even in very low concentrations. The persistency is solid for days. The burning mixture, 10 minutes.

Tactical Use. A harassing agent.

Detection. Best detected by odor which is variously described as aromatic, locust blossom, apple blossom or ripe fruit.

Protection. Service gas mask gives complete protection. Impregnated or impervious protective clothing is impractical for these agents because of the climatic conditions under which they would be used.

CHLORACETOPHENONE SOLUTION—CNS

Physical Properties. This is a mixture containing CN, chlorpicrin, and chloroform. Persistency in summer—one hour in the open, two hours in woods; winter—six hours in the open, one week in the woods.

Tactical Use. A harassing agent.

Protection. The gas mask. Protective clothing impractical.

CHLORACETOPHENONE SOLUTION—CNB

Physical Properties. This is a mixture of CN, carbon tetrachloride and benzene.

Persistency. Not determined.

Tactical Use. A harassing agent.

Detection. By the odor which is somewhat similar to benzene.

Protection. Service gas mask. Protective clothing impractical.

Pathology. (General) The pathology is transitory unless the cornea is damaged, then ulceration may result. When the liquid solution is spilled on the skin a severe burn may result.

Symptoms. (General) There is a burning and stinging of the eyes. The irritation results in a copious outflow of tears, photophobia and blepharospasm. High concentrations will cause a maddening sensation of pins and needles sticking in the skin.

Diagnosis. (General) is made by:

1. Odor of agent
2. Marked lacrimation
3. Predominance of eye symptoms
4. Mild skin irritation

First Aid. (General) Individuals exposed should be quickly removed from the area if gas mask is not available and the tactical situation permits. They should face the wind with the eyes open and the clothing loosened. The effects of the agent are usually relieved about 20 or 30 minutes after removal from the area. The eyes must *not* be rubbed or bandaged.

Medical Treatment. (General) The eyes may be irrigated with a 2% solution bicarbonate or 2% boric acid solution. The skin irritation will usually respond to soap and water followed by calomine lotion.

Prognosis. There are seldom any after effects and these agents never cause death under field concentrations.

IRRITANT SMOKES

The irritant smokes are those chemical agents used to produce sensory irritation to the nose, throat, and eyes, and are dispersed with the aid of heat in clouds containing very fine particles, the smaller the size of the particles, the more severe the irritant action. These smokes are of no value for screening purposes.

These agents do not cause death in field concentration, although they make the casualty wish that he might die. It has been said that we can get a good idea of the effects of irritant smokes if we visualize a patient suffering from a toothache, a headache, sinus trouble, bronchitis and seasickness all at the same time. Because of the delayed action of these agents, symptoms may not appear from mild exposure for several minutes after the mask has been put on. The victim believes his gas mask to be leaking and removes it too soon, inhaling more gas.

ADAMSITE—DM

Physical Properties. A solid agent which in the pure form is bright yellow in color. Plant run product is a dark greenish or brown color. It is soluble in water and only moderately soluble in most organic solvents. The hydrolysis product is a solid arsenic oxide which is very toxic when swallowed.

Persistency. When dispersed by candles—10 minutes in the open both summer and winter.

Tactical Use. A harassing agent.

Detection. DM has almost no odor to the average man and it usually is detected only by symptoms developing following exposure. A brilliant canary yellow cloud can be seen near the point of emission. Toxic effects are produced by quite invisible amounts.

Protection. The service gas mask.

NOTE: Because of the delayed action of the irritant smokes it is necessary in training troops in the use of the gas mask to instruct them not to remove the masks even if symptoms occur.

Pathology. There is local irritation of the nose and accessory sinuses, throat and eyes.

Symptoms. These consist of pain and a feeling of fullness in the nose and accessory nasal sinuses, a severe headache, accompanied by intense burning in the throat and pain in the chest. There is a copious flow of tears because of the eye irritation. Sneezing is violent and persistent. Nausea and vomiting are often present. Mental depression is marked.

Diagnosis. This is made from the history of exposure, and the relatively rapid spontaneous improvement which occurs.

First Aid. Remove to pure air if possible. Guard and forcibly restrain the patient, if necessary, to prevent his self-injury. When the victim vomits into his gas mask, instruct him to hold his breath, remove mask, wipe it and reapply.

Medical Treatment. Aspirin for the headache, general rest, pure air, and make the patient as comfortable as possible.

Prognosis. There are no sequelae and the symptoms usually disappear about 1 hour after removal to fresh air.

SNEEZE GAS—DA

Physical Properties. In the pure form DA is a colorless, crystalline solid; plant run product is dark brown, viscous, semi-solid mass.

Persistency. Five minutes in summer or winter when dispersed by high explosives; detonation, ten minutes when disseminated by candles.

Tactical Use. A harassing agent.

Detection. No pronounced odor although to some it appears to have an odor similar to shoe polish.

Protection. Best type of smoke filter in gas mask canister.

Pathology. Temporary sensory irritation of eyes, nose and throat.

Symptoms. These consist of a severe headache and feeling of fullness in the nose and sinuses, nasal secretion, burning sensation in the throat and tightness and pain in the chest. There is a marked conjunctival injection and irritation as well as lachrymation. Due to the increased saliva flow, nausea and vomiting are common. This causes the individual to remove his gas mask, and he gets another dose of the gas. One outstanding symptom is the utter mental despair that these patients exhibit. They would rather die than continue to suffer such extreme agony.

Diagnosis. History of exposure, symptoms as listed above, and rapid, spontaneous recovery.

First Aid. Since these casualties exhibit *suicidal tendencies* they must be under constant guard to prevent them from harming themselves. They should be removed to pure air when possible, or the mask must be worn between spells of vomiting.

Medical Treatment.

1. Aspirin or acetophenatin for headache.
2. Irrigate eyes, nose and throat with boric acid solution or saline.
3. Inhale diluted chlorine from wide mouthed bleach bottle.
4. A moderate dose of morphine may be necessary to help control the patient.
5. 48 hours rest may be necessary to give patient mental rest.

Prognosis. Effects usually wear off in an hour or two. No persistent after effects follow exposure to these agents.

SYSTEMIC POISONS

These agents will have only a limited use because of the difficulty of building up concentrations under field conditions. There is practically no possibility of hydrogen sulphide or carbon monoxide being used. Hydrocyanic acid or arsine might be used under circumstances where a concentration could be built up, such as in a pill box or fixed fortification, within a ship or tank. The service gas mask gives complete protection against all except carbon monoxide and a special canister attachment is needed for that.

HYDROCYANIC ACID

Physical Properties. Clear colorless, highly volatile liquid. The vapor disperses readily in air. It is very soluble in water and alcohol. Water solutions do not turn litmus red.

Persistence. Non-persistent.

Tactical Use. A casualty producing agent.

Detection. The odor resembles that of bitter almond.

Protection. The service gas mask will protect against field concentrations, and in enclosed spaces, *provided* the mask is worn at the time the grenade or shell bursts.

Pathology. This agent immobilizes the oxygen in the blood stream so that it can not be given up to the body tissues. This leads to tissue asphyxia, and depresses and paralyzes the central nervous system, beginning with the medulla, stimulating the vomiting, vagus and vasomotor centers.

Symptoms. Symptoms come on immediately following the inhalation of high concentrations. Vertigo, headache, cardiac palpitation, and dyspnea are shortly followed by coma, convulsions, asphyxiation and death. In dilute concentrations the patient has a sensation of constriction of the throat, unpleasant taste in his mouth, mental confusion, dizziness and labored breathing.

Diagnosis.

1. Odor of bitter almonds.
2. Rapid onset of symptoms.
3. Chain of symptoms as described.

First Aid. Remove the casualty from the enclosure to pure air at once. Institute artificial respiration when indicated. Amyl nitrite fumes should be inhaled for fifteen to thirty seconds every three minutes. Absolute rest and heat are indicated.

Medical Treatment. Treatment *must* be started immediately to be effective. Amyl nitrite inhalations continued and a 1% solution of sodium nitrite slowly given intravenously in 10 c.c. doses until a total of 50 c.c. is given in an hour. Epinephrine may be employed to decrease the fall in blood pressure. 20 c.c. doses of 5% sodium thiosulfate should be given intravenously between the nitrite injections to a total of 500 c.c. if necessary. 1% methylene blue in 1.8% sodium sulfate in 50 c.c. doses to a total of 200 c.c. may be given intravenously instead of the sodium nitrite. Whole blood transfusion is indicated to offset the marked cyanosis from the methylene blue.

Prognosis. The mortality of acute cyanide poisoning is very high, *i.e.*, about 95%, because death usually occurs before therapy can be instituted or has time to be effective. If the patient survives the initial effects and is still alive after 1 hour he will generally recover. Sequelae are very rare.

ARSINE

Physical Properties. A colorless, inflammable gas produced by the action of water on the arsenides, calcium, magnesium, and sodium.

Persistence. Non-persistent.

Tactical Use. A casualty producing agent.

Detection. Arsine has a characteristic garlic-like odor and metallic taste. The possibility exists that the inhalation in concentrations not detectable or recognizable by odor may cause toxic symptoms.

Protection. Protection is afforded by the service gas mask.

Pathology. Arsine produces no irritation of the skin or mucous membranes. It is

readily absorbed from the respiratory tract and even in low concentrations, not detectable by odor, may cause toxic symptoms. It attacks principally the red blood cells, causing hemolysis, conversion of part of the liberated hemoglobin to methemoglobin, and even destruction of these cells. The kidneys become blocked by the debris of the red blood cells and precipitation of hemoglobin in the tubules. Arsenical hepatitis is a common complication.

Symptoms. When only a small quantity of the agent has been inhaled there will be mild symptoms, such as general lassitude, headache and possibly chills, nausea and vomiting. In higher concentrations there is added a pronounced hemolytic anemia and methemoglobinemia, a slatey cyanosis of the skin that later changes to jaundice bronze.

The urinary symptoms are marked, characteristically being: hemoglobinuria, oliguria, anuria and uremia.

Diagnosis. Based on essential factors:

1. History of exposure.
2. Cyanosis of skin.
3. Marked anemia.
4. Late jaundice.
5. Urinary symptoms:
 - a. Urine deep brown to red color.
 - b. Oliguria, anuria, uremia.

First Aid. General supportive measures such as rest, heat, and immediate removal to pure air.

Medical Treatment. Sodium bicarbonate or citrate drinks for alkalization; forced fluid intake to help diuresis and help keep the kidney open; should be given up to 4000 c.c. per 24 hours. Glucose solution is helpful to counteract the liver damage. Mercurial diuretics are *contraindicated*. Anemia calls for blood transfusions, iron and liver extracts.

Prognosis. Even the more severe cases may recover; others may die within 2 to 6 days. When death occurs it is due to a severe anemia or kidney blockage and anuria.

INCENDIARY AGENTS

These agents, *white phosphorus*, *thermit*, *electron* and *incendiary oils*, simply cause deep thermal burns that are treated the same as any other severe burn. There is one exception and that is white phosphorus. This substance is identified by the odor of burnt matches, and in contact with the skin will cause severe burns. When the particles come in contact with the air they reignite, so we must keep the particles wet. The suggestion has been made that the particles be covered with mud, but this is inadvisable because it is not an efficient means of extinguishing the burning particles, and there is a great likelihood of introducing infection into the wound.

WHITE PHOSPHORUS—WP

Physical Properties. A pale yellow, translucent, crystalline solid of waxy consistency. It is extremely active chemically and combines with oxygen very readily. If left exposed to air at ordinary temperatures it at once begins to oxidize. Heat is generated at the same time, raising its temperature, thus increasing the rate of oxidation until it spontaneously bursts into flame.

Tactical Use. Screening agent.

Detection. Odor—like burnt matches.

Protection. None needed against smoke. Fireproof suits against burning particles.

Pathology. Any degree of burn from a first degree burn to complete destruction of the tissue.

Symptoms. Pain, swelling, erythema, destruction of tissue.

Diagnosis. The presence of a tissue burn and the white phosphorus particles with a burnt match odor and a tendency to reignite on contact with the air.

First Aid. This consists of extinguishing the blaze by keeping the part submerged in water or keeping the wound covered with a saturated cloth. Water from the canteen or even urine may be used if nothing better is available.

Medical Treatment. Consists of picking the particles of white phosphorus out of the wound while the part is still submerged in water, or at least wet. A 5% or 10% solution of copper sulphate may be used to form an airtight metallic coating over the phosphorus particles until they can be removed. The exact percentage of the copper sulphate solution is not important, just enough copper sulphate to make the water quite blue. After the particles have been removed the wound is treated as any other burn.

Another method of emergency treatment has been suggested:

First Stage: Remove the bulk of the free phosphorus and superficial acid with alkali powder (Formula 2_a, 10% of heavy magnesium oxide, 5% of borax and 85% of sodium carbonate.) The burned area should be covered with water and the powder sprinkled on the wet surface, more water being added as necessary, to make a medium thick paste. Wash or wipe off and reapply as long as effervescence continues.

Second Stage: Immobilize the whole of the remaining free phosphorus by using glycerin, copper sulphate paste (22.5% copper sulphate, 67.5% glycerin, 5% starch and 5% water.) Remove as soon as no smell of phosphorus is present.

Third Stage: Neutralize the deepseated penetration of acid by reapplying powder (formula 2_a), work into a paste with water and bandage the wound.

Fourth Stage: Final treatment should *not* be employment of coagulation therapy (tannic acid, picric acid, silver nitrate), as the acid products would be sealed in the wound. The continued treatment should be alkaline and might consist ideally of Bunyon's envelope treatment with hypochlorite solution.

EVACUATION OF GAS PATIENT

Let us emphasize that by far the greater majority of soldiers who come in contact with a chemical agent will NOT be evacuated. If the protective ointment is used AT ONCE by the individual soldier and he wears his gas mask he will not become a casualty.

Those who are caught without their gas masks or do not use the protective ointment, or whose clothing becomes grossly contaminated, may eventually become real casualties and then, on authority of a superior officer they would leave their posts and go to the battalion aid station for medical treatment. Most of the hydrocyanic acid cases will either be completely recovered or a fatality before they can be evacuated to the rear.

The lung irritant cases who are to be evacuated must be litter cases and carried in the recumbent position during the entire period of transportation.

It is the plan of the Medical Department of the United States Army that gas casualties will be treated at any of its medical installations in the theatre of operations but provisions for the immediate *segregation* of these cases must be incorporated in the standing operating procedures of each medical unit. Gas casualties when transported in ambulances must be entirely separate from the other casualties. In the battalion aid station, regimental aid station, collecting station and clearing station decision must be made by the medical officer whether the case should be evacuated to the rear or retained at the installation. Those who get to the clearing station will receive the more comprehensive treatment.

In addition to these medical units we now have medical gas treatment battalions under army control which are dispatched as needed to augment the clearing or collecting stations mentioned above when gas casualties are especially heavy. Each clearing platoon of the medical gas treatment battalion consists of a bath section and two treatment sections. The ambulances for this unit could be furnished by the medical ambulance battalion, motor. Any personnel handling gas casualties must be provided with the necessary protective clothing and masks.

The clearing stations in the theatre of operations are necessarily mobile and must follow the tactical forces; therefore, careful selection is made of the patients for disposition, each case being considered with judgment and discretion as to his prognosis. All slightly gassed cases who are expected to recover completely in a few days are kept at the clearing station and are returned to the front on recovery. Those cases which

are the results of lung irritants must be kept at the sites of reception (normally the clearing station) wherever possible for a period of 48 hours until their maximum illness is over and until they no longer require oxygen therapy. Then they would continue back through the medical chain of evacuation. Cases which have been seriously gassed by mustard are evacuated to the rear as soon as their temporary needs have been provided. The early evacuation of the mustard case is carried out because mustard does not cause acute pulmonary edema and therefore does not present the difficulty of transportation that phosgene cases do. They are sent from the clearing station to the evacuation hospital, where they go through a process of sorting, bathing, and assignment to the proper ward for gas patients.

There is a new 400 bed motorized evacuation hospital in the process of development that is destined to replace the present surgical hospital. This unit will normally back up the division and may be located in the vicinity of the clearing station. Conceivably some of the gas casualties may go from the clearing station to this new unit.

When possible the slightly gassed are separated from the seriously gassed and the mustard cases are separated from those suffering from pulmonary edema.

Since gas casualties occur in great numbers, when they do occur, it may be necessary to set up a separate clearing station or evacuation hospital to care for them.

Gas casualties go from the evacuation hospital to a general hospital for their final definitive treatment. They should be sent from there to a convalescent camp as soon as they are sufficiently recovered.

Because gas casualties occur in great numbers, need complete segregation, careful handling, classification and special treatment, they add a very heavy burden to the evacuation system and medical department personnel in the theatre of operations.

The development of a satisfactory air evacuation service for use in combat areas is a possibility to be considered. There are many types of surgical emergencies that would take precedence over the gas casualties. If the gas casualties are transported by air ambulance, it should have an air-sealed litter section in which the pressure could be kept at the desired constant level since any change in pressure will have its effect, particularly upon the lung irritant cases.

CHAPTER VIII

AVIATION MEDICINE

AVIATION MEDICINE IN EVOLUTION

Man has always dreamed of flying. After centuries of those dreams, with experiment and the development of other necessary knowledge, the airplane became the answer to his quest. With the discovery of the art a new strain was placed upon the human system for the doctor to analyze, determine the hazards, and proffer a means by which they might be reduced in effect or entirely avoided. Thus the science of medicine has been made available to mankind in order to assure a greater safety and a more certain development of this tremendous achievement.

Pilots are exposed to environmental factors with which they are entirely unfamiliar. Each is placed in control of a powerful mechanical device which may tax to the utmost his mental and physical stamina. Ever increasing speeds and altitudes attained in flight force a close study of the human equation of the pilot which may lead to the complete recognition of the necessary physical and mental qualifications of flyers. The aviator must return instantaneous and correct mental and physical responses to all situations which may confront him, often with startling suddenness. The life of his passengers, the successful accomplishment of a mission, and the preservation of his plane, as well as his own life, may hang upon this slender thread. The science of aviation presents complex problems which must be fully understood, its phenomena completely charted. In this necessary work the doctor will find again his chance to serve humanity.

The following data traces the primary steps in medical knowledge from its inception, as it has been developed to meet the peculiar requirements of aviation.

1783

June 5. The first balloon flight without passengers was made at Annonay, France. In the same year the first effort was made to study the effects of flying upon life. Sheep and fowls were sent up a few hundred feet in balloons, the investigators discovering to their surprise that no ill effects resulted from the ascent.

December 17. The first record of physical discomfort from altitude was made during a balloon ascent to 10,500 feet. The balloonist complained of the severe cold as well as pain in his right ear and jaw.

1786

Ballooning was recommended for convalescents and to promote longevity. The first handbook on aeronautics was published. The author, although not a doctor, believed the change from the hot and impure air near the ground to the cool, pure air aloft, which was said to be impregnated with aerial acid, was beneficial to the sick. He stated: "The spirits are raised by the purity of the air and rest in a cheerful composure. In an ascent all worries and disturbances disappear as if by magic." Diseases such as tuberculosis and neuralgia he claimed could be cured by the therapeutic value of the atmosphere at high altitudes.

1800

Scientific records were made of the effect of altitude upon the human body. The ill effects were called "balloon sickness". Doctors of medicine were among the pioneers in these early scientific studies.

1866-1870

Dr. Charles H. Blackley made a quantitative study of the pollen content of air. Oil-coated slides were exposed at ground levels to collect the pollens deposited by the force of gravity. Then, by means of sending these oil-coated slides aloft on kites, he exposed them at altitudes of from 1,000 to 1,500 feet. His experiments proved the abundance of fungus spores present in the air and the possibility that their allergic reactions were similar to those of pollens.

1903-1911

In December, 1903, Wilbur and Orville Wright made four successful power-driven flights

in an airplane at Kitty Hawk, North Carolina. On February 10, 1908, the United States Army signed a contract with the Wright Brothers for the purchase of the first Army plane.

On September 17, 1908, Lieutenant Thomas Selfridge, Signal Corps, was killed and Orville Wright severely injured at Fort Myer, Virginia, when their plane crashed. This was the first fatal accident resulting from flying.

There was little medical interest in aviation except the spasmodic interest in the physiology of altitude. Although the speed factor was beginning to be added to that of altitude, no special physical examination was required for military aviators, and no physical examination of any kind for civilian aviators was required during this period.

1912

February 2. The War Department published the first instructions concerning the physical examination required of candidates for aviation duty. In its preparation the Surgeon General, collaborating with the Chief Signal Officer, devised a special preliminary physical examination to be required of all candidates for instruction at the Signal Corps Aviation School.

February 7. The draft of the plan for this special preliminary physical examination was submitted to the Secretary of War for approval. It was, in brief, as follows:

All candidates for aviation duty to be subjected to a rigorous physical examination to determine their fitness for such duty.

The examination to conform to the standard required for recruits, with the following additions:

The *visual acuity* without glasses to be normal. Any error of refraction requiring correction by glasses or any other cause diminishing acuity of vision below normal to be cause for rejection. The candidates ability to *estimate distances* to be tested. *Color-blindness* for red, green, or violet to be a cause for rejection.

The following tests for *equilibrium* to be made to detect otherwise obscure diseased conditions of the internal ear:

The candidate to stand with knees, heels, and toes touching.

The candidate to walk forward, backward, and in a circle.

The candidate to hop around the room.

These tests to be made first with the eyes open, and then with the eyes closed, on both feet and then on one foot. Deviations of a persistent nature, either right or left, were held to indicate the presence of a diseased condition of the internal ear. *Nystagmus*, frequently associated with this condition, was also a cause for rejection.

Any disease of the *circulatory system*, either of the heart or arterial system, *respiratory system*, or *nervous system* to be a cause for rejection.

The precision of the *movements of the limbs* to be tested with special care.

Any candidate whose history showed that he had ever been or was afflicted with chronic digestive disturbances, chronic constipation, or intestinal disorders tending to produce dizziness, headache, or impairment of vision to be rejected.

October 8. The United States Navy published instructions governing the physical examination required of their candidates for aviation duty which were similar to those used by the Army. There was added a group of exercises to determine the precision of the movements of the limbs. Should these exercises manifestly tire the individual he was required to be further examined to discover the presence of a defect or deformity. A marked departure from normal blood pressure was considered to be a cause for rejection in the Navy test.

1913

A plan for the conduct of examinations and selection of pilots was instituted by Germany.

1914

Italy adopted a special physical examination for Army flyers.

July. Civilian aviators in the United States, whose fame as flyers was well known to the public, had never been examined physically.

1915

Great Britain made an analysis of her air casualties for the first year of the World War which showed that 2 per cent of the pilots met death at the hands of the enemy, 8 per cent from defective planes, and the remaining 90 per cent due to pilot errors. The British thereupon established a special "Care for the Flier Service," whereby the aviators were selected with due regard to their physical and mental qualifications. At the end of the second year fatalities attributed to physical and mental defects were reduced to 20 per cent and at the end of the third year to 12 per cent. Thus Great Britain demonstrated the benefits of a special medical examination for flying personnel.

1917

April 6. The United States entered the World War. At this time the aviation personnel of the Army consisted of 65 officers and 1,120 enlisted men. In a little more than a year it was expanded to 14,230 officers and 124,767 enlisted men. The knowledge and experience of the Allies was placed at the disposal of the United States Army.

April 28. The *Air Service Medical* was organized. Major T. C. Lyster recommended that a medical officer be placed in charge of the physical examination of all applicants for duty with the Aviation Section, Signal Corps.

May. Form 609, A. G. O., which was later designated Form 64, A. G. O., (still used for recording physical examination of Air Corps officers) was prescribed for recording the physical examination for flying.

May 11. Major T. C. Lyster, in addition to his other duties, was detailed to take charge of the aviation work in the Surgeon General's Office. This assignment included the supervision of administrative requirements for the physical examination of all applicants for duty with the Aviation Section, Signal Corps.

July. Sixty-seven Physical Examining Units were established in cities of the United States.

September. Colonel T. C. Lyster was assigned to duty as the Chief Surgeon, Aviation Section, Signal Corps.

October. The *Medical Research Board* and *Medical Research Laboratory* for the study of aviation medicine were organized. The Board consisted of Major John B. Watson, S.O.R.C., Major Eugene R. Lewis, M.R.C., Major William H. Wilmer, M.R.C., Major Edward G. Seibert, M.R.C., and Dr. Yandell Henderson, a civilian. The purposes of the board were: (1) To investigate all conditions which affect the efficiency of pilots; (2) To institute and carry out, at flying schools or elsewhere, such experiments and tests as would determine the ability of pilots to fly in high altitudes; (3) To conduct experiments and tests to develop suitable apparatus for the supply of oxygen to pilots in high altitudes; (4) To act as a standing medical board for the consideration of all matters relating to the physical fitness of pilots.

The board instituted six departments of the Medical Research Laboratory and appointed a director for each: *Otology, Cardiovascular, Physiology, Psychology, Psychiatry and Neurology, and Ophthalmology.*

December. General Theodore C. Lyster and Major Isaac Jones were sent to Europe to investigate the work in aviation medicine as developed by the Allies of the United States.

1918

The *Central Medical Research Laboratory*, Hazelhurst Field, Mineola, New York, was completed and began operation.

June. The laboratory space of the Central Medical Research Laboratory was enlarged to three times its original size. The officer personnel was much increased, barracks were erected for the enlisted men, and the work at the laboratory increased rapidly both in amount and importance. The laboratory also functioned as a training school for flight surgeons and for instructing physical trainers for their work at the several flying schools. Officers and enlisted men were instructed in the methods and duties of classification-units for selection of pilots. Aviators were given low-oxygen-tension tests, either in low pressure tanks or by means of the rebreathing machine. By this time the selection of the flier had been standardized, his care put in charge of flight surgeons, and the classification of the aviator recognized as a vital necessity for the efficiency of the Air Service.

The term "Chief Surgeon, Aviation Section, Signal Corps" was eliminated because the Air Service Division (Air Service Medical) was created as part of the Surgeon General's Office.

July 6. Branch medical research laboratories were established at twenty flying fields.

The Manual of the Medical Research Laboratory was published by the War Department.

August. In response to a cable from General Pershing, 34 officers and 15 enlisted men who had been well trained in laboratory methods sailed for Europe. Colonel William H. Wilmer headed the Medical Research Board of the American Expeditionary Force. He concluded that the board saved the lives of hundreds of aviators and, with the cooperation of the pilots, would save hundreds more. The board was created to advise, cooperate with, and assist aviators in saving themselves.

October. The Air Service Manual was published.

1919

March 14. The Medical functions of the Air Service were returned to the administration of a Chief Surgeon, Medical Section, Air Section, as had been the case during the early part of 1918.

May. The first course of instruction for flight surgeons, eight weeks in duration, was given at the Medical Research Laboratory, Hazelhurst Field, Mineola, New York. It was the first systematic course of its kind.

August-November. The Medical Research Laboratory and School for Flight Surgeons was moved to Mitchel Field, New York. The course for flight surgeons was extended to four months.

1920

The War Department published Document Number 1004, "Aviation Medicine in the American Expeditionary Force".

1921

February. The War Department listed the Medical Research Laboratory and School for Flight Surgeons as a "special service school".

March. A fire destroyed many of the records and much of the equipment of the School for Flight Surgeons.

During this year Dr. E. C. Stakman made the first quantitative tests of upper air pollens and spores during his investigation of the spread of black stem rust of wheat. In Louisiana, Dr. William Scheppegele made a study of the concentration of pollen in the upper air. He recognized several types of pollen and concluded that spores were not responsible for hay fever.

Since 1921 airplanes and balloons have been used to collect samples of fungus and spores, oil-slides or agar plates being used as a surface area for collection. These studies have furnished a major part of the present knowledge of air-borne allergens.

1922

April. The first group of medical officers of the Navy was graduated as flight surgeons.

November 8. The Medical Research Laboratory and School for Flight Surgeons was changed to "The School of Aviation Medicine" by A.R. 305-105.

1923

The Adjutant General approved extension courses to be given by the School of Aviation Medicine.

1926

Lieutenant Colonel David A. Myers established by research the basic principles, from the human standpoint, on which the art of blind flying is founded. His work was done in collaboration with Lieutenant Colonel William C. Ocker, Air Corps, who is the father of blind flying. It was published in the Army Medical Bulletin of July, 1937.

The first text book on Aviation Medicine was published by Colonel Louis H. Bauer. He was appointed Medical Director of the Aeronautics Branch of the Department of Commerce which was created this same year. Medical examiners were appointed by the Department of Commerce throughout the United States so that the examination of private

and student pilots, as well as commercial and industrial pilots, would be made promptly and with little inconvenience.

June 30. The School of Aviation Medicine was moved from Mitchel Field, New York, to Brooks Field, San Antonio, Texas, where it occupied the "Big Balloon Hangar" until its next move.

1927

May. The School of Aviation Medicine was moved out of the balloon hangar into permanent quarters.

1929

October 7. Following a number of preliminary conferences stimulated by the Medical Section of the Aeronautics Branch of the Department of Commerce, the *Aero Medical Association* was organized at a meeting held in Detroit, Michigan. The announced purpose of this organization was to make a study of the new specialty, "aviation medicine." It was decided at this meeting to produce a journal devoted to the study of the subject.

1930

The first issue of the "Journal of Aviation Medicine" was published.

1931

A pamphlet entitled "Aviation Medicine" was published by direction of the Secretary of War at the Medical Field Service School. It is Army Medical Bulletin No. 26, copies of which can still be secured through the Book Shop, Medical Field Service School, Carlisle Barracks, Pennsylvania.

October 30. The School of Aviation Medicine was moved from Brooks Field to Randolph Field, San Antonio, Texas, the site of the Air Corps Primary Training Center. This location enabled it to function advantageously as a teaching as well as a research institution.

1933

Major Malcolm C. Grow, Post Surgeon, Fairfield Air Depot, Patterson Field, Ohio, advocated the establishment of a medical laboratory at Wright Field near Dayton, Ohio, to be a part of and to work with the Experimental Engineering Section of the Materiel Division of the Air Corps. He experimented on clothes suitable for flying and the effects of carbon monoxide gas from internal combustion engines.

During the year Colonel and Mrs. Charles A. Lindbergh exposed 27 slides over Greenland and the North Atlantic. This study of pollens was projected by Dr. F. C. Meier of the United States Department of Agriculture.

1934

Colonel Malcolm Grow was transferred to the Office of the Chief of the Air Corps as Chief of the Medical Section. Captain Harry G. Armstrong, Medical Corps, was sent to Wright Field for the sole mission of establishing and supervising the research unit.

1935

May 29. The Chief of the Air Corps directed that a Physiological Research Laboratory be created at the Materiel Division of the Air Corps at Wright Field, Dayton, Ohio. This was promulgated for the purpose of continuing the experiments which Lieutenant Colonel Malcolm Grow had started in the spring of 1933 on his own initiative. His study of the various types of clothing and the relationship to high altitude flying helped to convince the Air Corps authorities of the need for a physiological research laboratory.

1937

January 1. The Physiological Research Laboratory was completed. Captain Harry G. Armstrong, Medical Corps, was announced as the Director, and Dr. J. W. Heim was placed in charge of research. (Further details about the laboratory are to be found in a later paragraph of this chapter.)

The first issue of "Flight Surgeon Topics" was published by the School of Aviation Medicine. The chief purpose of this publication is to distribute to flight surgeons timely information on aviation medicine and related topics.

Dr. F. C. Meier, Department of Agriculture, who had promulgated many upper-air studies since 1931, originated the term "aerobiology," for the science of allergy and bacteriology of the air. Dr. Meier and Dr. E. B. McKinley, his co-worker, were lost with the Hawaiian Clipper while making studies over the Pacific Ocean.

1938

September 2, 3, and 4. The Tenth Annual Convention of the Aero Medical Association was held at Dayton, Ohio. At this convention the School of Aviation Medicine displayed an exhibit of items important to aviation medical circles.

October 13, 14, and 15. The School of Aviation Medicine provided an exhibit at the 46th Annual Convention of Military Surgeons of the United States which was held at Rochester, Minnesota.

During this year upper-air studies (aerobiology) were conducted on a large scale by O. C. Bonham, botanist, during the ragweed season. Slides were made over nine states at elevation levels up to 9700 feet. These studies were made from planes of commercial air lines operating between Denver and New York. No heavy contamination was found to exist above 5000 feet, but allergens were located at 7500 feet and a few at 9000 feet. Planes with enclosed cabins were found to be relatively free from pollen contamination. Aerobiology, greatly facilitated by aviation, offers a new field for medical research.

"Special Flying Cadet Examining Boards" were appointed to visit many colleges and universities to acquaint students with the army flying training program and to conduct physical examination of applicants for training as flying cadets.

1939

April 1. The Medical Section was re-designated the Medical Division and assigned to the Training Group, Office, Chief of the Air Corps, by order of the Chief of the Air Corps.

1940

Changes in Army Regulations provided that graduates of the School of Aviation Medicine would be rated as "Aviation Medical Examiners." An aviation medical examiner who has served a minimum of one year of active duty with the Air Corps after having received such qualifications and who has demonstrated that he possesses the required qualifications may be rated as "Flight Surgeon."

1941

The War Department established eighteen branches of the School of Aviation Medicine at various Air Corps stations in the United States, the Panama Canal Zone, and Hawaii.

1942

March 2. War Department Circular No. 59, relative to the War Department reorganization designates the chief medical officer under the Army Air Forces as the Air Surgeon.

THE FLIGHT SURGEON

The Flight Surgeon is a doctor of medicine who has received additional training and experience in aviation medicine. He bears the same relationship to aviators as does the specialist in preventive medicine to mankind in general in that both deal with the prevention of disability and the maintenance of physical efficiency. At the present stage of development of the subject this training may be secured at the School of Aviation Medicine or one of its branches, all of which are operated by the Army. The main school is located at Randolph Field, Texas. All flight surgeons of the Army or Navy as well as the Medical Directors of the larger commercial air lines are graduates of this school who have been recommended by its faculty as qualified for the duty. The relatively few doctors of medicine in civilian practice who include this specialty are almost entirely drawn from the Medical Reserve Corps of the Army or Navy who have been trained and certified as qualified at this important Army school. It is a worthy and useful career for the air-minded medical man.

Duties of the Flight Surgeon. It is a well established fact that many persons lack the physical or psychological make-up to function efficiently and with safety in three-dimensional space; therefore many people are unqualified to operate airplanes. The British proved this in the World War when, by identifying the cause of crashes, they reduced the accidents resulting from pilot failure by 50 per cent the first year of corrective methods and to less than 12 per cent during the second year.

The aviator, and especially the military aviator, must have vision that is nearly perfect. It is essential that he have a strong heart and an efficient circulatory system in order that he may tolerate altitude and cold. He requires perfect neuromuscular control and co-ordination for the complicated manipulation of airplanes at all altitudes while in flight. He needs a psychological equilibrium capable of instant and correct judgement to meet the situations which develop in his routine duties. The detection and recording of these conditions is an important responsibility of the flight surgeon.

One of the important duties of the flight surgeon is to examine candidates for flying instruction in order to eliminate all who do not clearly meet the standards which are known to be necessary. In this way young men who are potential crash victims because of some physical or mental shortcoming which may be entirely unknown to them are saved from hazards they are not constituted to meet.

It is not enough to make certain that flying candidates are physically and mentally qualified for the tasks before them. Aviators must be re-examined at periodic intervals and their health kept under close observation by a flight surgeon. In this way only may the diminution of any of these essential qualities be detected in time to prevent the hazards of the air which lead to crashes. It is desirable and necessary that the flight surgeon acquaint himself with the life and habits of each pilot under his medical supervision to detect practices or conditions which may injure his physical or mental health in any way or which may affect his ability as a flier. The maximum safety to passengers, plane, and pilot may be obtained only when aviators are able to meet to a satisfactory degree the physical and mental requirements which experience and research have proven to be necessary.

Further responsibilities of the flight surgeon are the classification of pilots for high altitude missions and the type of airplane to which the pilot is best suited.

In the Army in peacetime the flight surgeon carries on the normal duties of the medical officer as well as his specialty. The preservation of health, the prevention of disease, and the care of the sick are no less important in the Air Corps than with the rest of the Army, and the same administrative duties are required. He must, however, become more thoroughly familiar with the administrative details pertinent to the handling of sick and injured in the Air Corps. He must constantly be alert to the activities of the officers of the Air Corps, socially as well as on duty, in order that he may determine or locate influences that might affect those officers who might indirectly come under his care.

The duties of the flight surgeon are broad and in the special sense very detailed and specific, in order to bring many generalities to a fixed conclusion. Reaction and behavior must be recorded and scrutinized by experience and knowledge in order to protect human life and property and to keep our air force in the most efficient condition.

Qualifications of the Flight Surgeon. The flight surgeon must be equipped with an extensive *professional knowledge*, experience and interest in his medical work, including a knowledge of psychology, psychiatry, ophthalmology, otology, cardiology, traumatic orthopedics, altitude physiology, and the special problems of aviation medicine. He must be thoroughly informed about the work of the airplane pilot.

Certain *personal qualifications* are necessary. His character and professional attainments must be of such high standards as to inspire the confidence and respect of the flying personnel. The fliers will then realize that he can smooth out their various problems and difficulties; that because of his interest, manifested by tact, sympathy, tolerance, and sincerity, they feel his aim is to keep them in such condition that they will be fit to fly. The flight surgeon must have initiative, be emotionally well-balanced, a good mixer, and of unquestionable character and good habits. He must be willing to fly with pilots

whom he finds physically qualified for flying. His knowledge of flying, of airplanes, and of Air Corps tactics must be such as to enable him to understand the problems, difficulties, and dangers of the pilot and to discuss them intelligently.

Flight surgeons are not made in a day, and, as in any specialty, their value increases with their experience. *Practical experience* will add much to his knowledge, and over a period of years the Army or Navy flight surgeons will have had many pilots under their care and supervision, learning their individual habits, qualifications, and characteristics. They will come to know these pilots so intimately that this knowledge may be the indirect means of saving valuable lives and property by preventing crashes by pilots who are borderline cases, and who would be removed from flying, at least temporarily, by experienced flight surgeons. As aviation medicine, a product of the World War, is one of the youngest specialties, the flight surgeons of today are comparatively young. Although years of experience with troops, hospitals, and the general practice of medicine increase his wisdom, the flight surgeon must never lose his sense of appreciation for the joys and sorrows of the young pilot. The flight surgeon must realize that as long as he is in the company of one more of the pilots under his care, he is never entirely "off duty." He must study each pilot without prejudice or personal feelings, until he can detect the slightest departure from normal health, almost before the subject himself becomes aware of it. He must learn when to warn, when to comfort, and when to ignore.

How to Become a Flight Surgeon. In accordance with Par 18, A.R. 350-500 the following information is extracted for reference:

Selection and detail of officers and enlisted men for courses at the School of Aviation Medicine will be made upon recommendation of the Surgeon General and the Commanding General, Army Air Forces.

Officer students, so far as practicable, for each of the courses specified below will be selected from the classes of officers indicated in connection with those courses.

Basic Course. Officers of the Medical Corps of the Regular Army. Officers of the Medical Corps of the National Guard and of the Medical Corps Reserve who are eligible in accordance with instructions of the War Department and who are willing to devote the necessary time to this course.

Extension Course. Medical officers of the Regular Army, National Guard, and Organized Reserves, in accordance with such policies as may be prescribed from time to time by the War Department.

Graduate Course. Such graduates of this school as may be recommended by the commandant and the Surgeon General as having shown special aptitude for the study of medical subjects in their relation to aviation.

Successful completion of the Basic Course of instruction for the complete period of four months, or the completion of the extension course of instruction and six weeks of the practical training given in the Basic course, and recommendation of the faculty of the School of Aviation Medicine qualify a medical officer as an aviation medical examiner. A year of active duty thereafter with the Air Corps is required for qualification as flight surgeon.

THE SCHOOL OF AVIATION MEDICINE

The School of Aviation Medicine was established at its present site at Randolph Field, San Antonio, Texas in 1931. Randolph Field is the Primary Training Center of the Air Corps and offers an excellent location both geographically and functionally for the training of flight surgeons and technical assistants to flight surgeons. Due to the recent increase in the Air Corps, eighteen branch schools are established at various Air Corps stations.

Purpose. The School of Aviation Medicine was created to instruct medical officers of the Regular Army, National Guard, and Reserve Corps to perform efficiently the special duties of flight surgeons, in peace or war, and to coordinate such duties with other professional and non-professional activities which they may be called upon to perform as medical officers of the army.

Origin and History. To continue the training of flight surgeons after the World War,

the School of Aviation Medicine was established in 1919 at Mitchel Field, Long Island, New York. The United States had in October, 1918, instituted a Medical Research Board to investigate all conditions which affected the efficiency of fliers. This early work was done at Hazelhurst Field, Mineola, New York, where the Medical Research Laboratory was established. Medical officers of the Army were detailed to this laboratory for special training in aviation medicine, and following such training these specialists served with various army aviation units. They became known as flight surgeons. In February, 1921, the Medical Research Laboratory and School for Flight Surgeons was classified and listed as a special service school. In November of the following year the name was changed to its present one, 'The School of Aviation Medicine,' by A.R. 305-115. The school was moved from Mitchel Field, New York to Brooks Field, Texas in 1926. It was housed there in the "Big Balloon Hangar" until May, 1927, when more permanent quarters were provided. Upon the establishment of the Air Corps Primary Training Center at Randolph Field, Texas, the school was moved in 1931 to its present location at Randolph Field. The building for the School of Aviation Medicine is adjacent to the station hospital building, permitting close professional contact with the local medical establishment. The School of Aviation Medicine in conjunction with the Primary Training Center functions as a teaching and research institution. Eighteen branch schools were established in 1941.

Organization and Administration. The School of Aviation Medicine is under the jurisdiction of the Chief of the Air Corps, and is supported financially by the Air Corps. The Surgeon General of the Army cooperates in arranging its program of instruction and in securing candidates for flight surgeons for the Air Corps from the Medical Corps of the Regular Army.

The function of the school is three fold: (1) instruction and training; (2) investigation and research; and (3) the conduct of extension courses.

The personnel of the school includes a commandant, assistant commandant, executive officer, adjutant, instructors, enlisted men, civilian clerks, and technicians. The school is divided into four departments, each one in charge of a director who is a member of the faculty: *Ophthalmology and Otology*, *Aviation Medicine*, *Psychology*, and *Neuropsychiatry*. These departments have specific objectives with reference to the training and instruction of flight surgeons:

Ophthalmology and Otology. To instruct student officers in:

The fundamentals and the basic factors of ophthalmology, such as the anatomy, histology, physiology, and pathology of the eye and its adnexa.

The diagnosis and the treatment of common ocular affections.

The special diagnostic methods and instruments utilized in the examination of the eye.

The anatomy and physiology of the nose, throat, and ear, with special attention to the labyrinth.

The diagnosis and treatment of the common affections of the ear, nose, and throat.

The care and maintenance of the flier; ophthalmological and otological aspects.

The procedure of conducting the examination of the eye, ear, nose, and throat for flying, in accordance with A.R. 40-110.

Aviation Medicine. To instruct student officers in:

The diagnostic methods especially applicable to the physical examination for flying.

Abnormalities and anomalies of general bodily function, with special reference to the cardiovascular system.

The ill effects of low oxygen pressure on flying personnel and methods employed in preventing anoxia at high altitudes.

The cause and prevention of fatigue.

The physiology and hygiene of muscular exercise.

The organization and function of the Air Corps and of the Medical Department on duty with the Air Corps.

Airplane accidents with special reference to:

The common accidents and injuries resulting therefrom.

Demonstration of, and instruction in, the use of crash tools.

Methods of splinting.

The use of orthopedic appliances as temporary fixation and treatment before and during transportation.

The care and maintenance of the flier; general physical aspects.

The preparation of records, reports, and returns which pertain exclusively to the Medical Department on duty with the Air Corps.

Technical subjects pertaining to aviation, Air Corps tactics and organization, together with a sufficient number of demonstration flights in various types of aircraft in order that the student may better understand and appreciate the problems of the pilot; all by selected Air Corps instructors.

The procedure of conducting the general physical examination for flying in accordance with A.R. 40-110.

Psychology. To instruct student officers in:

The methods and subject matter of psychology.

The methods of determining the psychological fitness of applicants for flying training by means of neuropsychic examinations, reaction time tests, and flying adaptability tests.

The methods of detecting beginning psychological inefficiency in flying personnel.

The care and maintenance of the flier; psychological aspects.

The procedure of conducting the psychological examination for flying in accordance with A.R. 40-110.

Neuropsychiatry. To instruct student officers in:

The fundamentals of psychological conception of mental disease.

The psychopathic personalities and their reactions.

The minor psychoses.

The frank psychoses.

The care and maintenance of the flier; neuropsychiatric aspects.

The procedure in conducting the neuropsychiatric examination for flying in accordance with A.R. 40-110.

Courses of Instruction. The instruction and training which the school gives to officers of the Medical Corps of the Regular Army, National Guard, and Reserve, include:

The organization and administration of the Medical Department as related to special requirements of the Air Corps.

The principles and technique of physical examination for flying training and tests of fliers.

The application of tests for physical efficiency.

The physical care of fliers.

The medical specialties as related to aviation medicine, including neuropsychiatry, physiology, ophthalmology, otology, psychology, and cardiology.

The instruction and training given to selected enlisted men for specialists' courses is made up of those subjects required for proficiency as first, second and third class technicians of the Medical Department and for qualification as assistants to flight surgeons.

The *Basic Course* of instruction for the Regular Army medical officers who are selected to attend the school for the purpose of becoming flight surgeons covers a period of four months. During peacetime two basic courses are conducted annually, commencing July 15th and December 1st of each calendar year. At present, the basic course has been reduced to three months' duration. On completion of the course, Army aviation medical examiners proceed to Air Corps military establishments.

Army extension courses in aviation medicine and allied subjects of the basic course of instruction are conducted by correspondence for medical officers of the Regular Army, Reserve Corps, and National Guard, requiring approximately two years to complete. Upon successful completion of the correspondence course, the medical officer may apply for attendance to the resident's course of practical training to complete qualification for a flight surgeon.

The supplementary *resident's course* of six weeks' duration is given at the school for

the practical training of Medical Reserve Corps and National Guard officers who have completed the correspondence courses to enable these officers to qualify as flight surgeons. This practical training is given during the latter part of each basic course; upon successful completion a certificate of graduation as an aviation medical examiner is awarded.

The purpose of each of the above courses is to fit officers of the Medical Corps of the three components of the Army of the United States to perform efficiently the duties of a flight surgeon in the professional, administrative, and personal relations:

Selection of candidates for flying.

Care of the flyer.

Classification of the flier.

Including the year 1940, over 550 medical officers have graduated and been qualified as aviation medical examiners and flight surgeons on completion of one of the above courses. This number has more than doubled during the year 1941 and 1942.

A *graduate course* of instruction is given to graduates of the school as may be recommended by the commandant and the Surgeon General as having shown special aptitude for the study of medical subjects in their relation to aviation.

During peacetime two specialists' courses of three months (6 weeks' course at present) each are given for selected enlisted men of the Medical Department of the Army, each of whom upon graduation receives a certificate as a specialist qualifying him as an assistant to a flight surgeon. This rating places them in position to accept ratings as first, second, or third class technicians in the Medical Department.

Besides the above course the school carries on many research projects in aviation medicine and the physical qualifications of flying personnel. Much research work is conducted in conjunction with the Physiological Research Laboratory at Wright Field, Dayton, Ohio.

The necessary detailed information relative to the provision, selection, and detail of students to the School of Aviation Medicine may be found in A.R. 350-500. Application to attend the School of Aviation Medicine should be forwarded to The Adjutant General, United States Army, Washington, D. C., through military channels.

THE PHYSIOLOGICAL RESEARCH LABORATORY

The Physiological Research Laboratory was created to conduct research pertaining to the development of equipment and matériel required to permit Air Corps personnel to function under the adverse and often abnormal conditions experienced in flight.

Origin and History. In October, 1918, during the World War, the United States Army instituted a Medical Research Board for the purpose of investigating all conditions which affected the efficiency of fliers. The board carried on its studies and investigation in the Medical Research Laboratory, Hazelhurst Field, Mineola, New York, which was completed and began operation the same year. In 1919 the establishment moved to Mitchel Field, New York, where the institution was known as the Medical Research Laboratory and School for Flight Surgeons, since, in addition to carrying on research, a course was given for flight surgeons. Army regulations changed the name to "The School of Aviation Medicine" in 1922, after which the research work conducted was carried on secondarily to the operation of the school. When the service school was transferred to Brooks Field, Texas, and later to the Air Corps Primary Training Center at Randolph Field, Texas, so much advancement had taken place in aviation that there became a need for research in the equipment and matériel in order to permit the pilots to function normally under the added strain and hazards of speed and high altitude flying.

With these considerations in view, the need for a research laboratory such as was operated during the World War and until 1920 became increasingly clear to Lieutenant Malcolm C. Grow, Medical Corps, then Surgeon of Patterson Field, near Wright Field, Dayton, Ohio. On his own initiative in the spring of 1933 he started some work at Wright Field. Each day, on completion of his regularly assigned duties at Patterson Field, he spent the rest of the day at Wright Field. Although no laboratory equipment was available, he experimented on aviation clothing, using several types of furs. Lambskin leather was found preferable to cordovan for outside covering of pilot garments because of its

lighter weight. He also brought about the adoption of the ski-pants type of trouser with a snug cuff at the bottom.

Later, in 1934, Colonel Grow became Chief of the Medical Section in the Office of the Chief of the Air Corps, and Captain Harry G. Armstrong, Medical Corps, was sent to Wright Field for the sole purpose of setting up and supervising a research unit, Colonel Grow having convinced the Air Corps of the value of this laboratory. On May 19, 1935, the Chief of the Air Corps directed the Chief of the Matériel Division, Wright Field, to create the Physiological Research Laboratory. This laboratory was completed January 1, 1937.

The Physiological Research Laboratory is located at Wright Field, Dayton, Ohio, in the Main Engineering Experimental Laboratory building of the Matériel Division of the Air Corps. It contains: an office; physiological, biochemical, and high altitude laboratories; operating room; balance room; and stock room. A centrifugal force laboratory is located in a portion of the balloon hangar. The various rooms are separated by steel and glass partitions and are completely air-conditioned, providing a suitable environment for gas analysis and other measurements requiring a uniform temperature. The biochemical laboratory is provided with all facilities for complete blood analysis and studies of a chemical nature. The large altitude chamber is of cylindrical construction and divided into three sections. A central compartment opens on either side into two end compartments, the central compartment serving as a lock through which entrance from the outside can be made to the other sections without disturbing the pressure conditions within. The chamber can be evacuated to the equivalent of 80,000 feet and can be refrigerated to -65 degrees Fahrenheit. The centrifugal force laboratory contains installations whereby forces twenty times the normal acceleration of gravity can be produced.

The office contains a library of standard medical books, reference works on aviation medicine, and appropriate current periodicals. All of the laboratories are fully equipped with the pertinent apparatus and devices to carry on their respective research.

The Physiological Research Laboratory is under the direction of an officer of the Medical Corps, who is termed the director. A doctor is in charge of the research. The work of the laboratory is coordinated with the research of the Matériel Division of the Air Corps located at the same field and also with the research work of the School of Aviation Medicine at Randolph Field, Texas.

Numerous projects have been completed since the laboratory was started, and many are undergoing continuous study. Research in the physiological requirements of high altitude flying is now one of the important projects of this laboratory. It presents a broad field for experimentation on the effects of cold, decreased atmospheric pressure, diminished oxygen supply, and allied climatic changes. In view of the many unsolved problems confronting aviation, due to more efficient performance of airplanes, the Physiological Research Laboratory will prove of great value in the advancement of aviation.

A new era in aviation is here. Large, multi-motored ships, manned by crews and flying at greater altitudes, are commonplace at present. Substratosphere flying will become a common occurrence. The construction of ships with sealed cabins, in which the barometric pressure at sea level is simulated, will allow the occupants to exist as comfortably and safely in the rarified atmosphere of great altitudes as they do on the ground. All this not only involves intricate engineering details but many physiological problems as well. The Physiological Research Laboratory at Wright Field, in charge of a flight surgeon, is conducting studies on physiological requirements for sealed high-altitude enclosures and on numerous other projects which affect the health and safety of Air Corps personnel. Many new books on aviation medicine have been published recently. Information relative to these books and to recent developments in the field of aviation medicine is published in the *Journal of Aviation Medicine*. It is the official publication of the Aero Medical Association of the United States. The office of publication is located at 2642 University Avenue, St. Paul, Minnesota.

Part III

Medical Tactics and Administration

CHAPTER I

ATTACHED MEDICAL PERSONNEL WITH UNITS OF THE INFANTRY AND CAVALRY DIVISIONS

Introduction. This chapter deals with the duties of those members of the Medical Department who are designated in War Department Tables of Organization as "attached medical personnel." Each major component of the infantry, armored, motorized, and cavalry divisions, as well as other organizations, is furnished a fixed quota of officers and men of the Medical Department who, in the usual case, are referred to collectively as the Regimental Medical Detachment. This personnel accompanies the unit to which attached in all tactical operations, functions under the immediate control of its commander, and is not to be confused with the medical battalion, or medical squadron which forms an organic part of the infantry, armored, or cavalry division.

In our Army the scheme of evacuation provides that men who become battle casualties receive their first treatment at the hands of the attached medical personnel. For this reason it has been truly said that they form the very backbone of the medical service available to combat divisions.

The strength, organization, and method of operation of attached medical personnel varies according to the nature and organization of the unit to which it is attached. The discussion of the organization and functions of the division medical battalion, or equivalent unit, is presented in Chapter II. In this chapter, for purposes of convenience and ready reference, the discussion of attached medical personnel is presented for various types of divisional organizations in the order listed below.

Detachments with Units of the Infantry Division.

Detachments with Units of the Cavalry Division.

The Interior Economy of the Attached Medical Personnel.

Duties of Commissioned Personnel.

Employment of the Attached Medical Personnel with Infantry.

Employment of the Attached Medical Personnel with Units other than Infantry.

Organization and Employment of the Attached Medical Personnel with the Armored Division.

Organization and Functions of the Regimental Medical Detachment. General. The regimental medical detachment is organized as follows:

Headquarters section.

One battalion or squadron section for each battalion or squadron of the regiment.

Veterinary sections for organizations having animals.

The *headquarters section of the medical detachment* is organized to provide administrative, supply, and communications service for the battalion medical sections. Its usual organization includes the regimental surgeon, the assistant regimental surgeon, two dental surgeons, and such enlisted personnel as the surgeon may deem necessary. The regimental surgeon is the senior medical officer. He directs and supervises the medical and dental services of the regiment and coordinates the veterinary services through the veterinarian in the organizations having animals. When necessary the headquarters section establishes and maintains a regimental aid station and dispensary for the care and treatment of troops located in the vicinity of regimental headquarters. It replaces the battalion or squadron medical section when it is necessary to keep them mobile or to permit them to keep contact with the unit supported.

The *battalion or squadron section* of which there may be one or more, is designed to function as a tactical unit. It consists of the battalion surgeon, the assistant battalion surgeon, and available enlisted personnel. In general, the total enlisted strength of any battalion or squadron section is approximately twice the strength of the headquarters section.

DETACHMENTS WITH UNITS OF THE INFANTRY DIVISION

The Regimental Medical Detachment with an Infantry Regiment. The medical detachment with an infantry regiment consists of 10 officers and 126 enlisted men. It is divided into a headquarters section and 3 battalion medical sections. (See Plates 1 and 2).

Headquarters section. The headquarters section consists of the regimental surgeon (major), the assistant regimental surgeon (captain), 2 dental officers (a captain and a first lieutenant), 1 technical sergeant, 1 sergeant, 16 technicians, and privates first class or privates. (T/O 7-11).

The sergeant is in direct charge of supply functions. If a regimental aid station is established he assists in applying dressings.

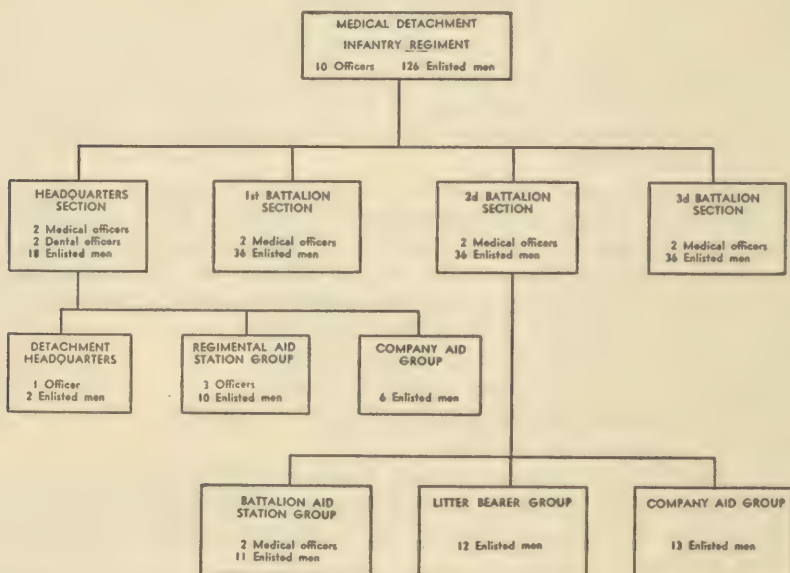


Plate 1. Functional Organization of the Regimental Medical Detachment with an Infantry Regiment.

The 16 technicians and privates first class or privates are medical, surgical, dental, and sanitary technicians, clerks, and chauffeurs. Three of these enlisted men serve as company aid men for the cannon company and three for the antitank company.

The *equipment, new pattern (97300) of the headquarters section* listed in the Medical Department Supply Catalog as changed by Changes 1942, consists of:

Blanket set, small	each 1 (97465)
Case, tent pins	each 1 (97515)
Chest, MD., No. 1	each 1 (97565)
Chest, MD., No. 2	each 1 (97570)
Cocoa Unit	each 1 (97655)
Lantern set	each 1 (97775)
Splint set	each 1 (97815)
Water sterilizing set	each 1 (97940)
Water sterilizing set, case, canvas, empty (97945)	ea. 1
Bucket, canvas, collapsible, QM	ea. 2
Cheesecloth or gauze, 36 inches wide	yards 2

Reagents:	box 1
Calcium hypochlorite, QM	tubes 50
Orthotolidine, QM	tubes 36
Litter, aluminum pole	each 6 (99350)
or	
Litter, (old type)	each 6 (78440)
Tent, pyramidal, 11 x 16 x 16 feet, complete, (with pins and poles)	each 1
Miscellaneous:	
Axe, handled, chopping, single bit, standard grade, 4-pound	each 1
Pick, handled, railroad, 6- to 7-pound	each 1
Shovel, hand, D-handle, round point	each 1
Rope, ½ inch, 40 feet	each 1
Flag, Geneva Convention (Red Cross) marker, with case and staff	each 1
Bucket, general purpose, galvanized, without lip, 24 gage, 14 quart	each 3

The transportation of the headquarters section consists of:

- 1 ¼-ton truck
- 1 ¼-ton trailer
- 1 2½-ton cargo truck

	1	2	3	4	5	6
	Unit	Technician grade	Headquarters section	3 battalions (each)	Total detachment	Remarks
2	Major.....		1		1	
3	Captain.....		(d) 1 2	1	5	
4	First lieutenant.....		d 1	1	4	
5	Total commissioned.....		4	2	10	* Includes 6 company-aid men—3 each for antitank company and cannon company.
6	Technical sergeant (673).....		1		1	
7	Staff sergeant (673).....			1	3	
8	Sergeant (673).....		1		1	
9	Corporal (673).....			1	2	
10	Technician, grade 4.....				9	
11	Technician, grade 5.....				19	
12	Private, first class.....		16	34	41	
13	Private.....				49	
14	Chauffeur (345).....		(2)	(2)	(8)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
15	Clerk, record (655).....	5	(1)		(1)	
16	Dental (667).....	5	(2)		(2)	
17	Litter bearer (657).....			(12)	(36)	
18	Medical (123).....	5	(1)	(2)	(5)	
19	Medical (123).....		(1)	(2)	(5)	
20	Sanitary (196).....		(1)		(1)	
21	Surgical (225).....	4		(b) 15	(14)	
22	Surgical (225).....	5	(*) 9		(31)	
23	Surgical (225).....			(3)	(9)	
24	Basee (521).....					
25	Total enlisted.....		18	36	126	
26	Aggregate.....		22	38	136	
27	Q Trailer, ¼-ton.....		1	2	7	
28	Q Truck, ¼-ton.....		1	2	7	
29	Q Truck, 2½-ton, cargo.....		1		1	

Plate 2. T/O 7-11, April 1, 1942. Organization of the Regimental Medical Detachment of an Infantry Regiment.

Battalion medical section. One battalion medical section is provided for each battalion of the infantry regiment. Each section consists of the battalion surgeon (usually a captain), the assistant battalion surgeon (usually a first lieutenant), a staff sergeant, a corporal, and 34 technicians, privates first class or privates. The battalion section is further divided into:

- An aid station group.
- A litter bearer group.
- A company aid group.

The *battalion aid station group* consists of 2 medical officers, 1 staff sergeant, 1 corporal, and 9 privates first class or privates.

The staff sergeant is in charge of the enlisted personnel and is a surgical assistant and dresser. He may be placed in charge of the property, the exchange of medical and

surgical supplies, water purification at the aid station, and the preparation of hot stimulants.

The corporal is an assistant dresser, has charge of the sterilization of instruments, the giving of hypodermic medication (under the immediate supervision of the medical officer in charge of the station).

One private first class or private is assigned to clerical duties. He prepares and keeps the station blotter, which gives all the required information concerning the cases which pass through the station.

Two privates first class or privates are chauffeurs of the trucks assigned to the battalion medical section. They may be used for general utility purposes around the aid station or wherever their services are required.

The *litter bearer group* consists of 12 privates first class or privates. In garrison or camp this group is chiefly employed in and about the camp dispensary. In combat the members of this group function as litter bearers, carrying wounded by hand from the company areas to the battalion aid station. They operate within the zone of action to which assigned, locating the men who have become casualties. They remove all seriously wounded promptly from the field to the aid station, direct and assist the walking wounded to the aid station, and assist the aid station group in moving and reestablishing the aid station. They also act as a channel of communication between the company aid men and the battalion surgeons and vice versa.

The litter bearer group may be divided into 3 four-bearer litter squads or 6 two-bearer litter squads. Each squad carries a litter. Each litter bearer has two medical pouches. The right hand pouch contains adhesive plaster, bandage scissors, safety pins, iodine swabs in a metal container, gauze bandages and a flask with cup for aromatic spirits of ammonia. The left hand pouch contains a pencil, a book of emergency medical tags, and first aid dressings.

The *company aid group* consists of 13 privates first class or privates, 1 being attached to each platoon as follows: 1 per rifle platoon, 1 per platoon of heavy weapons company, and 1 for the antitank platoon of the battalion headquarters company. They follow their respective platoons in battle, administering immediate emergency treatment. They direct the walking wounded to the aid station, indicating the shortest and safest routes thereto. They facilitate the work of the litter bearer squads by marking the location of seriously wounded or moving them to locations, sheltered and in defilade if possible, where the wounded may be found and evacuated more readily. The company aid men send information to the battalion surgeons relative to the tactical situation near the front line, locations of wounded, etc., by messages carried by the litter bearers or walking wounded.

Each company aid man is equipped with two medical pouches. The contents of each is identical with that carried by the litter bearer group.

The *equipment, new pattern (97205), of a battalion medical section* of the infantry battalion consists of:

Blanket sets, small	each 2 (97465)
Case, tent pins	each 1 (97515)
Chests, Medical Dept., No. 1	each 2 (97565)
Chests, Medical Dept., No. 2	each 1 (97570)
Cocoa units	each 2 (97655)
Lantern sets	each 2 (97775)
Bucket, canvas, collapsible, 10 qt.	each 1 (99140)
Splint sets	each 2 (97815)
Water sterilizing set. See list for headquarters section	each 1 (97940)
Litters, aluminum pole	each 12 (99350)
or	
Litters, wooden pole	each 12 (78440)
Tent, wall, small, complete with fly, pins, and poles	each 1
Miscellaneous:	
Axes, handled, chopping, single bit, standard grade, 4 pound	each 2
Picks, handled, railroad, 6- to 7-pound	each 2

Shovels, hand, D-handle, round point	each 2
Ropes, ½-inch, 40 feet	each 2
Flags, Geneva Convention (Red Cross) marker, with case and staff	each 2

The transportation of the battalion medical section of the infantry battalion consists of two ¼-ton trucks, and two ¼-ton trailers. The company aid men ride on the transportation of the company to which they are assigned. The trucks and trailers of the battalion medical section transport the medical equipment of the section. The unit surgeon rides with the battalion headquarters.

The Medical Detachment with Artillery. General. The medical detachments with artillery are organized in accordance with the functions and composition of the unit served. The transportation furnished the medical detachment is such that contact can be maintained with the unit with which it operates.

The unit surgeon and unit commander will use the medical personnel to the best advantage for the mission or missions to be performed by the command. Full advantage will be taken to use unit transportation for the evacuation of casualties, and to avoid litter carry. The ultimate practical solution of functional organization of the medical detachment therefore falls upon the decision of the unit surgeon to fit the plan of his commander. Consideration should be given to furnishing adequate medical service during operation of standing operating procedures.

	1	2	3	4	5	6	7
	Unit	Technician grade	Headquarters section	3 regimental sections (each)	Observation battalion section	Total	Remarks
2	Major.....			1		3	
3	Captain.....		1	3	1	11	
4	First lieutenant.....		1			1	
5	Total commissioned.....		2	4	1	15	
6	Technical sergeant, including.....			1		3	
7	Platoon (631).....			(1)		(3)	
8	Staff sergeant, including.....			2	1	7	
9	Section leader (652).....			(2)	(1)	(7)	
10	Corporal, including.....			2	1	7	
11	Medical (673).....			(2)	(1)	(7)	
12	Technician, grade 4.....					3	
13	Technician, grade 5.....		6	34	14	17	
14	Private, first class.....					42	
15	Private.....					60	
16	Battery aid (23).....			(10)	(5)	(35)	
17	Chauffeur (345).....			(1)	(7)	(3)	
18	Orderly, ambulance (696).....			(1)	(1)	(4)	
19	Technician, dental (667).....	5	(1)	(1)		(4)	
20	Technician, medical (123).....	5	(1)	(2)	(1)	(9)	
21	Technician, medical (123).....			(3)	(1)	(10)	
22	Technician, surgical (225).....	4		(1)		(3)	
23	Technician, surgical (225).....	5	(1)	(1)	(1)	(5)	
24	Technician, surgical (225).....			(3)	(1)	(10)	
25	Basic (521).....		(1)	(5)	(2)	(18)	
26	Total enlisted.....		6	39	16	139	
27	Aggregate.....		8	43	17	154	
28	Q Ambulance, ¼-ton.....			1	3	1	11
29	Q Truck, ¾-ton, command and reconnaissance.....			2	1	7	
30	Q Truck, 2¼-ton, cargo.....			2	1	7	

Plate 3. T/O 6-50, April 1, 1942. Organization of the Medical Detachment, Field Artillery Brigade.

The Medical Detachment of a Field Artillery Brigade. The medical detachment of the field artillery brigade is organized into a headquarters section, three regimental sections and an observation battalion section, a total strength of fifteen officers and 139 enlisted men. (See Plate 3, T/O 6-50.)

The Medical Detachment of the Division Artillery of the Infantry or Motorized Division. The medical detachment of the infantry or motorized division is organized into a headquarters section and four battalion sections with a total strength of 6 officers and 70 enlisted men. (See Plate 4, T/O 6-10.)

For functional organization of the medical detachment, division artillery, Infantry or Motorized Division, see Plate 5.

The Regimental Medical Detachment with the Artillery Regiment, 155-mm Howitzer, Truck-drawn. The medical detachment with an artillery regiment, 155-mm howitzer truck-drawn, is divided into a headquarters section and two battalion medical sections. (See Plates 6 and 7.)

	1	2	3	4	5	6
	Unit	Technician grade	Headquarters section	4 battalion sections (each)	Total	Remarks
1						
2	Captain.....		1	1	5	
3	First lieutenant.....		4	1	1	
4	Total commissioned.....		2	1	6	
5	Staff sergeant, including.....			1	4	
6	Section leader (632).....			(1)	(4)	
7	Corporal, including.....			1	4	
8	Medical (673).....			(1)	(4)	
9	Technician, grade 5.....				11	
10	Private, first class, including.....		6	14	21	
11	Private.....				30	
12	Battery aid (123).....			(5)	(20)	
13	Chauffeur (345).....		(1)	(3)	(13)	
14	Orderly, ambulance (096).....		(1)		(1)	
15	Technician, dental (067).....	5	(1)		(1)	
16	Technician, medical (123).....	5	(1)		(5)	
17	Technician, medical (123).....			(1)	(4)	
18	Technician, surgical (225).....	5	(1)	(1)	(5)	
19	Technician, surgical (225).....			(1)	(4)	
20	Basic (521).....		(1)	(2)	(9)	
21	Total enlisted.....		6	16	70	
22	Aggregate.....		8	17	76	
23	Q Ambulance, 34-ton.....		1	1	5	
24	Q Truck, 34-ton, command and reconnaissance.....			1	4	
25	Q Truck, 2½-ton, cargo.....			1	4	

4 Dental.
The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.

Plate 4. T/O 6-10, April 1, 1942. Organization of the Medical Detachment, Division Artillery, Infantry or Motorized Division.

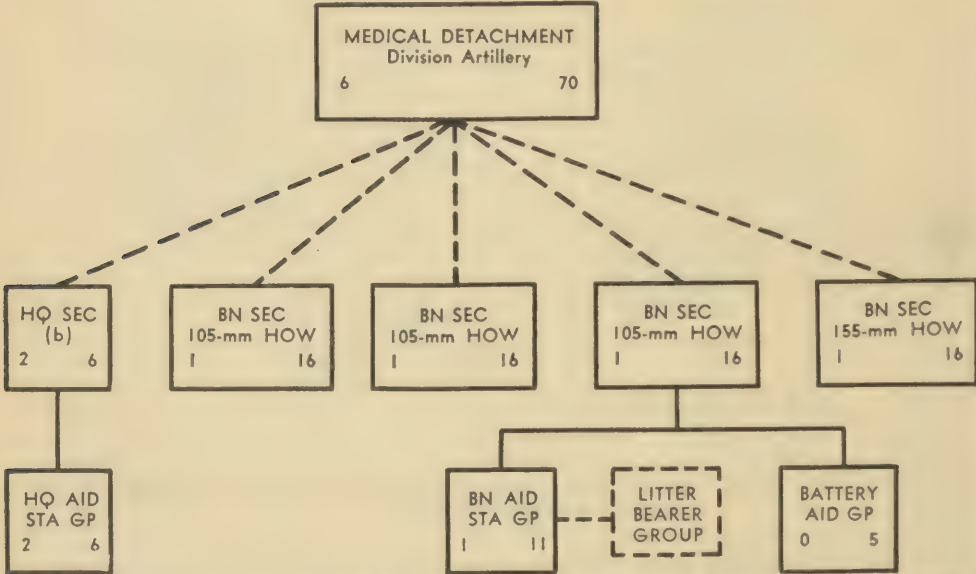


Plate 5. Functional Organization of the Medical Detachment, Division Artillery, of the Infantry or Motorized Division.

Headquarters section. The headquarters section consists of the regimental surgeon, one dental officer, a technical sergeant (platoon leader), 1 technician grade 4 (surgical technician), 1 technician grade 5 (dental technician), and 4 privates first class or privates (1 chauffeur, 1 ambulance orderly, 1 medical technician, and 1 basic). The assignments and duties of the commissioned and enlisted personnel are analogous to those of like personnel with an infantry regiment.

Battalion medical section. Each battalion medical section consists of a battalion surgeon, a staff sergeant (section leader), a corporal (medical), 2 technicians grade 5 (1 medical technician, 1 surgical technician), and 12 privates first class or privates (5 battery aid men, 3 chauffeurs, 1 medical technician, 1 surgical technician, and 2 basics), a total strength of one officer and 16 enlisted men. The assignments and duties of the

	1	2	3	4	5	6	7
1	Unit	Technician grade	Regimental section	2 battalion sections (each)	Total	Enlisted cadre	Remarks
2	Major.....		1		1		
3	Captain.....		41	1	3		
4	Total commissioned.....		2	1	4		
5	Technical sergeant, including.....		1		1		
6	Platoon leader (651).....		(1)		(1)	(1)	
7	Staff sergeant, including.....			1	2	2	
8	Section leader (652).....			(1)	(2)	(2)	
9	Corporal, including.....			1	2	2	
10	Medical (673).....			(1)	(2)	(2)	
11	Technician, grade 4.....				1	1	
12	Technician, grade 5.....		6	14	4	1	
13	Private, first class.....				12	1	
14	Private.....				17		
15	Battery aid (123).....			(5)	(10)		
16	Chauffeur (345).....		(1)	(3)	(7)		
17	Orderly, ambulance (696).....		(1)	(1)	(2)		
18	Technician, dental (967).....	6	(1)		(1)		
19	Technician, medical (123).....	5		(1)	(2)		
20	Technician, medical (123).....		(1)	(1)	(2)		
21	Technician, surgical (225).....	4	(1)		(1)		
22	Technician, surgical (225).....	5		(2)	(1)	(1)	
23	Technician, surgical (225).....				(3)	(1)	
24	Basic (521).....		(1)	(2)	(5)		
25	Total enlisted.....		7	16	39	7	
26	Aggregate.....		9	17	43	7	
27	Q Ambulance, ¼-ton.....		1	1	3		
28	Q Truck, ½-ton, command and reconnaissance.....			1	2		
29	Q Truck, 2½-ton, cargo.....			1	2		

^d Dental.
The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 600 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 600 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.

Plate 6. T/O 6-31, April 1, 1942. Organization of the Medical Detachment, Field Artillery Regiment, 155-mm Howitzer, Truck-drawn.

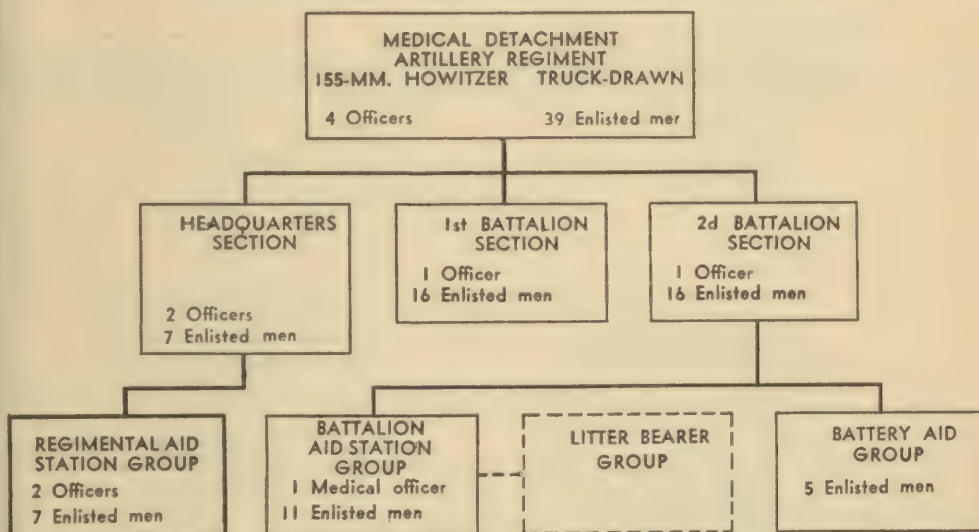


Plate 7. Suggested Functional Organization of the Regimental Medical Detachment with an Artillery Regiment, 155-mm Howitzer, Truck-drawn, T/O 6-31, April 1, 1942.

battalion surgeon and the enlisted personnel are analogous to those of like personnel with an infantry battalion.

The section is divided into:

A *battalion aid station group* which consists of a medical officer, a staff sergeant, a corporal, and 9 privates first class or privates.

A *battery aid group* of 5 privates first class or privates, who are assigned to duty as first aid men with each battery.

When necessary a litter bearer group is drawn from the aid station group.

Transportation. The equipment and transportation of the medical detachment is shown in Table of Organization 6-31 (Plate 6).

The **Regimental Medical Detachment** with the Artillery Regiment, 105-mm Howitzer, Truck-drawn. The regimental medical detachment with the artillery regiment, 105-mm Howitzer, truck-drawn, is identical in function, organization, and equipment with that of the 155-mm gun regiments. The total strength is 4 officers and 39 enlisted men. (See Plates 8 and 9).

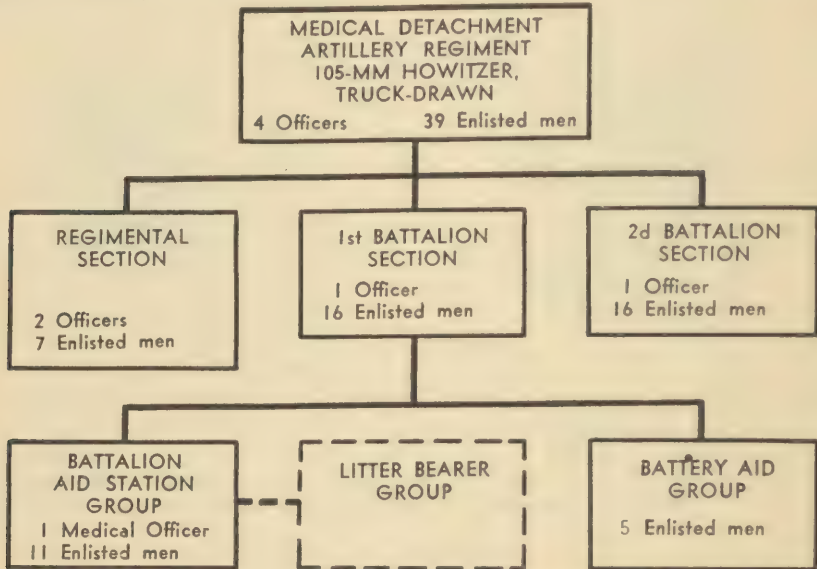


Plate 8. Suggested Functional Organization of the Regimental Medical Detachment with an Artillery Regiment, 105-mm Howitzer, Truck-drawn. T/O 6-21, April 1, 1942.

	1	2	3	4	5	6	7
	Unit	Technician grade	Regimental section	2 battalion sections (each)	Total	Enlisted cadre	Remarks
1	Major.....		1		1		
2	Captain.....		1		1		
4	Total commissioned.....		2	1	4		
5	Technical sergeant, including.....		1		1		
6	Platoon leader (651).....		(1)		(1)	(1)	
7	Staff sergeant, including.....		1		2		
8	Section leader (652).....		(1)	(2)	(2)	(2)	
9	Corporal, including.....		1		2		
10	Medical (673).....		(1)	(2)	(2)	(2)	
11	Technician, grade 4.....			1	4		
12	Technician, grade 5 including.....		6	14	12		
13	Private, first class.....				17	1	
14	Private.....						
15	Battery aid (123).....			(3)	(10)		
16	Chauffeur (345).....		(1)	(3)	(7)		
17	Orderly, ambulance (696).....		(1)		(1)		
18	Technician, dental (667).....	5	(1)		(1)		
19	Technician, medical (123).....	5		(1)	(2)		
20	Technician, medical (123).....	4	(1)	(1)	(3)		
21	Technician, surgical (225).....	4		(1)	(1)		
22	Technician, surgical (225).....	4		(1)	(1)	(1)	
23	Technician, surgical (225).....			(4)	(3)	(1)	
24	Basic (521).....		(1)	(2)	(5)		
25	Total enlisted.....		7	16	30	7	
26	Aggregate.....		9	17	43	7	
27	Q Ambulance, ½-ton.....		1	1	3		
28	Q Truck, ½-ton, command and reconnaissance.....			1	2		
29	Q Truck, 2½-ton, cargo.....			1	2		

Plate 9. T/O 6-21, April 1, 1942. Organization of the Regimental Medical Detachment with a Field Artillery Regiment, 105-mm Howitzer, Truck-drawn.

Regimental section. The regimental section consists of the regimental surgeon, one dental officer, a technical sergeant (platoon leader), a surgical technician grade 4, a dental technician grade 5, and 4 privates first class or privates (a medical technician, an ambulance orderly, a chauffeur, and a basic). The assignments and duties of the commissioned and enlisted personnel are analogous to those of like personnel with an infantry regiment.

Battalion medical section. Each battalion medical section consists of a battalion surgeon, a staff sergeant, a corporal, 2 technicians grade 5, 12 privates first class or privates. The assignments and duties of the battalion surgeon and the enlisted personnel are analogous to those of like personnel with an infantry battalion.

A **battalion aid station group** which consists of a medical officer, a staff sergeant, a corporal, and 9 privates first class or privates.

A **battery aid group** of 5 privates first class or privates who are assigned to duty as battery aid men with each battery.

When necessary a litter bearer group is drawn from the aid station group.

Transportation. The equipment and transportation of the medical detachment is shown in the Table of Organization 6-21 (Plate 9).

The Medical Detachment of the Field Artillery Battalion, Light, Truck-drawn. The organization, equipment, and transportation of the medical detachment, field artillery battalion, light, truck-drawn (T/O 6-25) is identical with the organization of a battalion medical section of the regimental medical detachment of the field artillery regiment, 105-mm howitzer, truck-drawn. (See T/O 6-21).

Medical Detachment, Field Artillery Observation Battalion. The medical detachment of the field artillery observation battalion is organized similarly to that of the 155-mm howitzer, battalion medical section. See T/O 6-75 (Plate 10).

	1	2	3	4	5
	Unit	Technician grade	Total	Enlisted cadre	Remarks
1					
2	Captain.....		1		
3	Total commissioned.....		1		
4	Staff sergeant, including.....		1		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 616-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
5	Section leader (652).....		(1)	(1)	
6	Corporal, including.....		1		
7	Medical (673).....		(1)	(1)	
8	Technician, grade 5.....		2		
9	Private, first class, including.....		5		
10	Private.....		7		
11	Battery aid (123).....		(5)		
12	Chauffeur (345).....		(1)		
13	Technician, medical (123).....	5	(1)		
14	Technician, medical (123).....		(1)		
15	Technician, surgical (225).....		(1)	(1)	
16	Technician, surgical (225).....		(1)		
17	Basic (521).....		(2)		
18	Total enlisted.....		16	3	
19	Aggregate.....		17	3	
20	Q Ambulance, ¾-ton.....		1		
21	Q Truck, ¾-ton, command and reconnaissance.....		1		
22	Q Truck, 2½-ton, cargo.....		1		

Plate 10. T/O 6-75, April 1, 1942. Organization of the Medical Detachment, Field Artillery Observation Battalion.

The Attached Personnel with the Engineer Units. The attached personnel with engineer units is distributed in accordance with the need or the mission of the engineer unit. The decision is made by the unit surgeon as approved by the unit commander, except with engineer units which are called upon to perform combat duty. The attached medical personnel are located several miles from the front of the divisional area. In such situations emergency treatment and medical attention may be obtained for engineer personnel through contact with medical units in their vicinity.

Attached Medical Personnel, Engineer Combat Battalion, Infantry Division. T/O 5-15, April 1, 1942. The personnel of the medical detachment, engineer combat battalion, infantry division includes one captain (medical officer), 2 first lieutenants (1 a dental officer), 1 staff sergeant, 1 corporal, 1 technician grade 4, 2 technicians grade 5, 7

privates first class and 8 privates. The transportation consists of one $\frac{3}{4}$ -ton ambulance, one $\frac{3}{4}$ -ton command and reconnaissance truck, and one $2\frac{1}{2}$ -ton cargo truck.

The Attached Medical Personnel with the Quartermaster Units. The organization of the detachment is dependent upon the distribution of the quartermaster unit and the mission of the unit to which the detachment belongs.

DETACHMENTS WITH UNITS OF THE CAVALRY DIVISION

The Regimental Medical Detachment with the Cavalry Regiment, Horse. (T/O 2-11, April 1, 1942). The medical detachment with the cavalry regiment is divided into a headquarters section, two squadron medical sections, and a veterinary section. (See Plate 11.)

Headquarters section. The headquarters section consists of the regimental surgeon, the assistant regimental surgeon, two dental officers, a technical sergeant, a sergeant, four technicians grade 5 (1 clerk, 2 dental technicians and 1 medical technician), one technician grade 4 (1 surgical technician), and nine privates first class or privates (2 truck drivers, 2 orderlies, 1 sanitary technician, 2 surgical technicians and 2 basics).

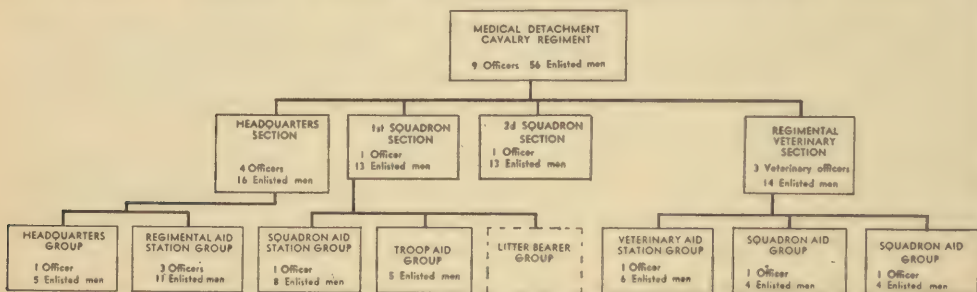


Plate 11. Suggested Functional Organization of the Regimental Medical Detachment with the Cavalry Regiment, Horse T/O 2-11, April 1, 1942.

Squadron medical section. Each squadron medical section consists of the squadron surgeon, a staff sergeant, a corporal, two technicians grade 5 (1 medical technician and 1 surgical technician), nine privates first class or privates (1 pack driver, 1 medical technician, 1 surgical technician, 5 troop aid men and 1 basic). For functional purposes the squadron section may be divided into:

A squadron aid station group.

A troop aid group.

When necessary a litter bearer group is drawn from the aid station group.

The duties of the personnel of a squadron medical section with cavalry are analogous to those of similar units serving battalions of infantry.

Veterinary section. The veterinary section consists of three veterinary officers, a staff sergeant, two sergeants, two technicians grade 5 (2 veterinary technicians), nine privates first class or privates (2 truck drivers, 2 pack drivers, 4 veterinary technicians and 1 basic). For functional purposes this section may be divided into a veterinary aid station group of one officer and six enlisted men and two squadron aid groups each consisting of one officer and four enlisted men.

Equipment and transportation. The equipment and transportation of the regimental medical detachment with cavalry is analogous to that of the medical detachment of an infantry regiment except in quantity. Pack animals are used to carry the equipment of the squadron sections. One $\frac{3}{4}$ -ton ambulance, one $\frac{3}{4}$ -ton weapon carrier truck and sixteen horses are assigned to the headquarters section. One $\frac{3}{4}$ -ton weapon carrier truck and one $\frac{1}{4}$ -ton truck are also assigned to the veterinary section. The transportation for the regimental medical detachment with the cavalry is as follows:

54 horses, riding.

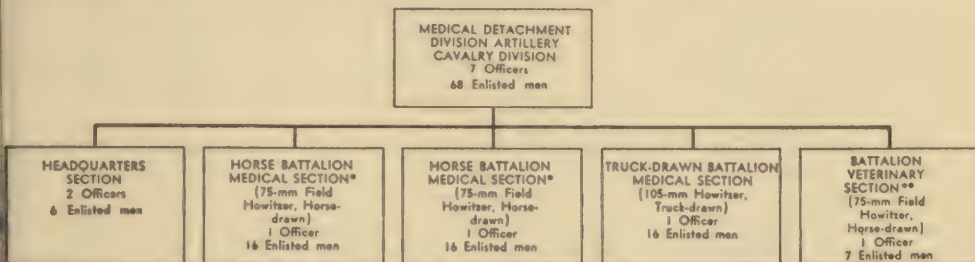
4 horses, pack.

1 ambulance, $\frac{3}{4}$ -ton.

1 truck, $\frac{1}{4}$ -ton.

2 trucks, weapon carrier, $\frac{3}{4}$ -ton.

The Medical Detachment With Division Artillery, Cavalry Division. The medical detachment with the division artillery, cavalry division, is divided into a headquarters section, 2 horse battalion medical sections, 2 horse battalion veterinary sections, and 1 truck-drawn battalion medical section. (See Plate 12.)



* Divided into: Aid station group, litter bearer groups, and battery aid group.

** Each section to operate a battalion veterinary aid station, one for each 75-mm field howitzer, horse-drawn battalion. Each section consists of 1 officer and 7 enlisted men.

Plate 12. Suggested Functional Organization of the Medical Detachment of the Division Artillery, Cavalry Division, T/O 6-110, April 1, 1942.

1	2	3	4	5	6	7	8
Unit	Technician grade	Headquarters section	Medical section	2 horse battalion sections (each)	Veterinary section	1 truck-drawn battalion section	Remarks
						Total	
1 Captain.....		1	1			4	
2 First lieutenant.....		1		1		3	
3 Total commissioned.....		2	1	1	1	7	
4 Staff sergeant, including.....						3	^a Mounted on horse.
5 Section leader (652).....			(1)		(1)	(3)	^{b1} additional horse, riding, when basic is authorized.
6 Sergeant, including.....				1		2	^d Dental.
7 Veterinary (250).....				(1)		(2)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26.
8 Corporal, including.....				(1)		(1)	A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
9 Medical (673).....				(1)		(1)	
10 Technician, grade 5.....						(1)	
11 Private, first class, including.....		6	14	6	14	20	
12 Private.....			(5)		(5)	(15)	
13 Battery aid (123).....				(1)		(2)	
14 Driver, pack animal (565).....				(1)		(1)	
15 Orderly, ambulance (696).....				(1)		(1)	
16 Technician, dental (667).....		5	(1)			(1)	
17 Technician, medical (123).....		5	(1)			(1)	
18 Technician, medical (123).....			(1)			(1)	
19 Technician, surgical (225).....		5	(1)			(1)	
20 Technician, surgical (225).....			(1)			(1)	
21 Technician, veterinary (250).....		5		(1)		(2)	
22 Technician, veterinary (250).....			(1)	(1)		(2)	
23 Truck driver (345).....			(1)	(3)		(10)	
24 Basic (521).....			(1)	(2)	(1)	(2)	
25 Total enlisted.....		6	16	7	16	68	
26 Aggregate.....		8	17	8	17	75	
27 Q Ambulance, $\frac{1}{4}$ -ton.....		1	1			4	
28 Q Animal, including.....						16	
29 Horse, pack.....						(2)	
30 Horse, riding.....						(14)	
31 Q Truck, $\frac{1}{4}$ -ton, command and reconnaissance.....			1			3	
32 Q Truck, $2\frac{1}{2}$ -ton, cargo.....			1			3	

Plate 13. T/O 6-110, April 1, 1942. Organization of the Medical Detachment, Division Artillery, Cavalry Division.

Headquarters section. The headquarters section consists of the regimental surgeon, one dental officer, three technicians grade 5, and three privates first class or privates. The assignments and duties of commissioned and enlisted personnel are analogous to the assignments and duties of like personnel in the headquarters section with an infantry regiment.

Horse battalion medical section. Each battalion medical section consists of a battalion surgeon, a staff sergeant, a corporal, two technicians grade 5, and twelve privates first class or privates. It is divided for functional purposes into:

A battalion aid station group.

A litter bearer group.

A battery aid group.

The duties of the battalion surgeon, aid station group, litter bearer group and battery aid group are analogous to the duties performed by the battalion surgeon and similar groups of the battalions of infantry. The battalion medical section, however, must retain a higher state of mobility in order to keep up with the mounted troops. Transportation facilities must be kept readily available.

Horse battalion veterinary sections. Each veterinary section consist of 1 veterinary officer, 1 sergeant, 1 technician grade 5, and 5 privates first class or privates. The duties of the commissioned and enlisted personnel are analogous to those of like personnel in the veterinary sections of the artillery battalion, 75-mm gun, horsedrawn. It is, however, a more mobile unit and transportation must be kept readily available.

1	2	3	4	5	6	7
Unit	Technician grade	Headquarters section	First section	Second section	Total detachment	Remarks
2 Major.....		1			1	
3 Captain.....		(1)2	1	1	4	
4 First lieutenant.....		1			1	
5 Total commissioned.....		4	1	1	6	* Aid men provided as follows:
6 Technical sergeant (673).....		1			1	Reconnaissance troop (3 each)..... 12
7 Staff sergeant (673).....		1	1	1	3	Support troop (3 each)..... 6
8 Sergeant, including.....		(1)			(1)	Headquarters troop..... 1
9 Supply (825).....		(2)			(2)	Service troop..... 1
10 Corporal, including.....		(1)	(1)	(1)	(3)	Total..... 30
11 Assistant section leader (652).....		(1)			(1)	Aid men ride in troop transportation.
12 Clerk (405).....		(1)			(1)	Dental.
13 Technician, grade 4.....						The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
14 Private, first class.....		19	16	16	51	
15 Private.....						
16 Driver, light truck (345).....		(6)	(2)	(2)	(10)	
17 Orderly (695).....		(2)			(2)	
18 Technician, dental (067).....		5	(2)		(7)	
19 Technician, medical (123).....		5	(1)		(6)	
20 Technician, medical (123).....		5	(1)	(1)	(7)	
21 Technician, sanitary (196).....		5	(1)		(6)	
22 Technician, sanitary (196).....		4	(1)		(5)	
23 Technician, surgical (225).....		5	(2)	(2)	(9)	
24 Technician, surgical (225).....		5	(2)	(2)	(9)	
25 Technician, surgical (225).....		5	(2)	(2)	(9)	
26 Troop aid man (123).....		(1)	(2)	(2)	(5)	
27 Basic (621).....		(1)	(2)	(2)	(5)	
28 Total enlisted.....		23	18	18	59	
29 Aggregate.....		27	19	19	65	
30 Q Ambulance, 3/4-ton.....		2			2	
31 Q Trailer, 1-ton, 2-wheel, cargo.....		1			1	
32 Q Truck, 3/4-ton.....		1			1	
33 Q Truck, 3/4-ton, command and reconnaissance.....		1			1	
34 Q Truck, 3/4-ton, weapon carrier.....		1	2	2	5	
35 Q Truck, 2 1/4-ton, cargo.....		1			1	

Plate 14. T/O 2-71, April 1, 1942. Organization of the Medical Detachment, Cavalry Regiment, Mechanized.

Equipment of battalion veterinary section is as follows:

Outfit Veterinary Field No. 1.

- 1 Chest, Medical Department, No. 80 (98070), Medical and Surgical (Instruments, appliances, drugs).
- 1 Chest, Medical Department, No. 81 (98080), Dressings, horseshoer's kit, miscellaneous equipment.
- 1 Lantern set, 3 lanterns (99547).
- 1 Desk, field company or 1 desk, field, Medical Department, No. 2 complete.
- 1 Axe with helve.

3 Buckets G. I. nested.

1 Fly for wall tent, large, complete with poles, pins, and ropes.

1 Fork, stable, short handle.

1 Marker, green cross, with staff.

1 Pickaxe with helve.

2 Picket pins, Model 1910.

50 foot rope, 1 inch, for field picket line.

1 Shovel, short handle, round point.

1	2	3	4	5	6
Unit	Technician grade	Medical section	Veterinary section	Total	Remarks
2 Captain.....		1		1	
3 First lieutenant.....		* 1		1	* Mounted on horse.
4 Total commissioned.....		1	1	2	* 1 additional horse, riding, when basic is authorized.
5 Staff sergeant, including.....		1		1	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
6 Section leader (652).....		(1)		(1)	
7 Sergeant, including.....			*	1	
8 Veterinary (250).....		(1)	(1)	(1)	
9 Corporal, including.....		1		1	
10 Medical (673).....		(1)		(1)	
11 Technician, grade 6.....				3	
12 Private, first class.....		14	6	7	
13 Private.....				7	
14 Battery aid (123).....		(5)		(5)	
15 Driver, pack animal (985).....			(* 1)	(1)	
16 Technician, medical (123).....		6	(1)	(1)	
17 Technician, medical (123).....		(1)		(1)	
18 Technician, surgical (225).....		6	(1)	(1)	
19 Technician, surgical (225).....		(1)		(1)	
20 Technician, veterinary (250).....			(* 1)	(1)	
21 Technician, veterinary (250).....			(* 3)	(3)	
22 Truck driver (345).....		(3)		(3)	
23 Basic (521).....		(2)	(1)	(3)	
24 Total enlisted.....		16	7	23	
25 Aggregate.....		17	8	25	
26 Q Ambulance, 3/4-ton.....		1		1	
27 Q Animal, including.....			8	8	
28 Horse, pack.....			(1)	(1)	
29 Horse, riding.....			(b 7)	(7)	
30 Q Truck, 3/4-ton, command and reconnaissance.....		1		1	
31 Q Truck, 2 1/2-ton, cargo.....		1		1	

Plate 15. T/O 6-45, April 1, 1942. Organization of the Medical Detachment, Field Artillery Battalion, 75-mm Gun, Horse-drawn.

The equipment is transported in a 2 1/2-ton cargo truck of the medical section of the battalion with which the veterinary section is operating.

Transportation of the medical detachment, division artillery. The transportation of the medical detachment of the artillery of the cavalry division, consists of:

14 horses, riding.

2 horses, pack.

4 ambulances, 3/4-ton.

3 trucks, cargo, 2 1/2-ton.

3 trucks, command and reconnaissance, 3/4-ton.

Regimental Medical Detachment, Cavalry Regiment, Mechanized. For organization and distribution of personnel and transportation of the medical detachment of the cavalry regiment, mechanized. See T/O 2-71, April 1, 1942 (Plate 14).

The Medical Detachment, Field Artillery Battalion, 75-mm Gun, Horse-drawn. For organization, distribution of personnel, and transportation of the medical detachment, field artillery battalion, 75-mm Gun, horse-drawn, see T/O 6-45, Plate 15.

The Medical Detachment, Field Artillery Battalion, 75-mm Howitzer, Horse. T/O 6-115, April 1, 1942. The organization, distribution of personnel, and transportation of this medical detachment is identical with that of the medical detachment, field artillery battalion, 75-mm gun, horse-drawn.

The Medical Detachment, Division Artillery, Mountain Division. The medical detachment, division artillery, mountain division operates similarly to that of the medical

detachment of the artillery of the cavalry division. For organization, distribution of personnel, and transportation see T/O 6-150, Plate 16.

INTERIOR ECONOMY OF THE ATTACHED MEDICAL PERSONNEL

The interior economy including *supply, reports, records, and pay* of a medical detachment conforms to that of similar organizations of other services of the army and is governed by the same regulations.

Messing. The regimental medical detachment messes with the headquarters company of the regiment it serves.

	1	2	3	4	5	6	7	8
			Headquarters section		4 battalion sections (each)			
	Unit	Technician grade	Medical section	Veterinary section	Medical section	Veterinary section	Total	Remarks
1								
2	Captain.....		1		1		5	
3	First lieutenant.....			1	(4)1	2	17	
4	Total commissioned.....		*1	*1	*3	*2	22	* Mounted on horse. b Mounted on mule.
5	Staff sergeant, including.....				b1		4	d Dental.
6	Section leader (652).....				(1)	b1	(4)	The serial number
7	Sergeant, including.....						(1)	symbol shown in parentheses is an inseparable part of the specialist designation.
8	Section leader (652).....		(1)				(4)	A number below 500
9	Veterinary (250).....					(1)	(4)	refers to an occupational specialist whose
10	Corporal, including.....			1	b1	b1	9	qualification analysis
11	Medical (673).....				(1)		(4)	is found in A.R. 615-26.
12	Veterinary (250).....			(b1)		(1)	(5)	A number above 500
13	Technician, grade 5.....						19	refers to a military occupational specialist listed in Circulars
14	Private, first class, including.....		5	1	(b3)23	7	49	Nos. 14 and 67, War Department, 1942.
15	Private.....						58	
16	Battery aid (123).....				(8)		(32)	
17	Driver, pack animal (545).....		(2)		(5)	(3)	(34)	
18	Technician, dental (967).....	5			(1)		(4)	
19	Technician, medical (123).....	5	(b1)		(1)		(5)	
20	Technician, medical (123).....				(3)		(12)	
21	Technician, surgical (225).....	5	(b1)		(1)		(5)	
22	Technician, surgical (225).....				(2)		(6)	
23	Technician, veterinary (250).....	5		(b1)		(1)	(5)	
24	Technician, veterinary (250).....					(3)	(12)	
25	Basic (521).....		(1)		(2)		(9)	
26	Total enlisted.....		6	2	25	9	144	
27	Aggregate.....		7	3	28	11	166	
28	Q Animal, including.....		5	3	13	7	88	
29	Horse, riding.....		(1)	(1)	(3)	(2)	(22)	
30	Mule, pack.....		(2)		(5)	(3)	(34)	
31	Mule, riding.....		(2)	(2)	(5)	(2)	(32)	

Plate 16. T/O 6-150, April 1, 1942. Organization of the Medical Detachment, Division Artillery, Mountain Division.

When troops are in the training area, on the march or in combat the regimental medical detachment usually messes as follows:

Headquarters section with the headquarters company or battery of the regiment.

Battalion or squadron medical and veterinary sections (less company, battery, or troop aid men) with the company, battery, or troop as assigned by the battalion or squadron commander.

Company, battery, or troop aid men with the company, battery, or troop which they are serving.

DUTIES OF COMMISSIONED PERSONNEL

Regimental Surgeon (Detachment Commander). The senior medical officer present commands the detachment and is the surgeon of the regiment. He serves in both an advisory and administrative capacity.

As a member of the staff of the regimental commander he advises that officer on medical and sanitary matters, all advice given or recommendations made to be in accord with the policies of higher medical authority.

He supervises all training of the detachment and instructs the entire personnel of the regiment in personal hygiene, field sanitation, and first aid.

He provides care and treatment for the sick and wounded.

He makes the sanitary inspections, supervising the sanitary procedures and precautions necessary to preserve the health of the command.

He makes timely requisitions for all necessary equipment, including medical, dental, and veterinary supplies.

He organizes the medical detachment and plans its work so as to insure the accomplishment of its mission with the least possible disturbance to the arm or service which it



Plate 17. Individual Equipment of a Battalion Surgeon.



Plate 18. Individual Equipment of a Battalion Surgeon.

serves. Such organization of the attached medical troops and such plans as he may make for their tactical employment are as simple as is consistent with the accomplishment of their mission.

He keeps such records and renders such reports and returns as may be required.

Assistant Regimental Surgeon. The assistant regimental surgeon is an officer of the medical corps, usually of the rank of captain or first lieutenant. In general, his duties are such as may be assigned to him from time to time by the surgeon. He acts for and in the name of the surgeon during that officer's absence from the command. He may be

detailed to supervise the preparation of reports and returns, the preparation of requisitions for supplies, and the issue of such supplies to sections of the medical detachment. He may also be placed in charge of the regimental dispensary and of the regimental aid station when it is established. Under the supervision of the surgeon, he may be detailed to hold sick call and conduct the training of the personnel of the headquarters section of the regimental medical detachment.

Battalion or Squadron Surgeon. The senior medical officer, usually a captain, assigned to duty with any battalion or squadron of the regiment is the battalion or squadron surgeon. In general, his duties within the battalion or squadron are analogous to the duties of the regimental surgeon within the regiment.

X **Assistant Battalion or Squadron Surgeon.** The assistant battalion or squadron surgeon is an officer of the medical corps assigned to duty with the battalion or squadron by the regimental surgeon. In general, the assistant battalion surgeon's duties in the battalion or squadron are analogous to the duties of the assistant regimental surgeon of the regiment. During combat he treats or supervises the treatment of casualties within the battalion aid station. Because the battalion surgeon's duties require him to leave the station occasionally, it is more practical for the assistant battalion surgeon to treat the seriously wounded.

Dental Officers. Dental officers of the detachment are subordinate to the senior medical officer of the detachment to which attached and are under his immediate command. In the interior organization of the detachment, dental officers are usually included in the headquarters of the regimental medical detachment and assigned to duty with separate battalions or squadrons of the regiment by the regimental surgeon whenever he considers such assignment necessary. Under the direction and supervision of the regimental surgeon, they are responsible for the dental care of the command. This includes the instruction of the entire personnel of the regiment in oral hygiene, the making of oral inspections to determine whether or not the command is practicing oral hygiene, the making of dental surveys to determine the amount and character of dental work to be done, and the accomplishment of this work in its order of importance to the command and to the individual. They establish and operate the dental service of dispensaries and during combat assist the regimental, battalion, or squadron surgeons, as the situation requires. They are usually retained within the headquarters section of the regimental medical detachment, but in the absence of a medical officer they may serve as regimental, battalion, or squadron surgeons. They are responsible for the diagnosis, care, and treatment of dental injuries received in combat. They keep dental records and render dental reports and returns as required.

Veterinary Officers. Veterinary officers are included in the regimental medical detachment of units supplied with animals. They are subordinate to the senior medical officer of the command and are under his immediate supervision and control. In general, their duties are as follows:

Full responsibility for the veterinary service of the entire command: This includes the initiation of protective measures for the prevention of communicable diseases, and the early detection, care, and treatment of such cases; the adoption of all necessary suppressive measures to limit the extension and duration of such diseases; the reduction of animal losses and inefficiency through the prompt discovery of the sick and wounded animals; the collection, isolation, care, and treatment of the sick and wounded animals until such time as they can be evacuated from the command or otherwise disposed of; the establishment and maintenance of a veterinary sanitary service within the command for the maintenance of animals in a suitable environment as regards shelter, handling, restraint, foods and feeding, grooming, work, exercise, and shoeing.

The establishment and operation of veterinary aid stations, and the collecting, care, and treatment of the sick and wounded animals of the regiment at such stations.

The inspection of meats, meat foods, and dairy products purchased or issued to troops.

The special training of veterinary personnel, and the instruction of personnel of the entire command concerning veterinary matters.

The keeping of records and the preparation and rendition of such reports and returns as are required.

EMPLOYMENT OF THE ATTACHED MEDICAL PERSONNEL WITH INFANTRY

In Garrison

The principal functions of the regimental medical detachment in garrison are: training, sanitary inspections, and operation of dispensaries.

Regiments ordered from the field to garrison will ordinarily be accompanied by their medical detachments. In large garrisons, personnel from the regimental medical detachments may be attached to the station hospital for technical training.

Sanitation of Stations and Permanent Camps. The duties of the medical detachment in connection with sanitation are inspectional and advisory. Sanitary procedure in a permanent station or camp is, in general, such as will modify and adapt the sanitary environment to the needs of the troops, rather than the temporary or expedient measures which may be used to protect the health of the command while in the field.

On the March

The medical service on the march concerns itself with the care and evacuation of march casualties.

Duties of Medical Officers. Prior to the march the commanding officer of the medical detachment obtains from the regimental commander his instructions as to the day's march and communicates to his subordinates such instructions as he may deem necessary for their information and guidance. He inspects the detachment as to its preparedness for participation in the march, giving particular attention to the condition of men, transportation, and equipment.

During the march, medical officers dispose of march casualties and conduct the march of troops under their direct command.

Disposition of the Regimental Medical Detachment for the March. The medical detachment is disposed in the column as directed by the regimental commander. The regimental surgeon usually marches with that part of the staff which accompanies the regimental commander. The assistant regimental surgeon marches with the headquarters section, the position of the latter being determined by the orders issued for the march. Dental officers march with the headquarters section when not assigned to battalion medical sections. The veterinary section of the regimental medical detachment (organizations having animals) marches with the regimental train.

Battalion and squadron surgeons march with the battalion or squadron commander. Assistant battalion or squadron surgeons march at the rear of the battalion or squadron and at the head of their respective battalion medical sections. When there is but one medical officer with the battalion or squadron he marches at the rear of the battalion or squadron column, going forward when necessary for the purpose of making contact with and gaining information from the commanding officer. Company, battery, and troop aid men march with the companies to which assigned. The remaining personnel of the section marches at the rear of the battalion or squadron column.

The trucks carrying the field medical sets of battalion medical sections while so marching are a constituent part of the battalion train; in like manner, the trucks of the headquarters section of the medical detachment are a constituent part of the train of the regimental headquarters company. When operations are imminent or march conditions cease, these trucks are released to the battalion or regimental surgeon (standing operating procedures).

Ambulance Service. Ambulances accompanying marching troops for the collection and evacuation of march casualties are detailed from ambulance sections of the collecting company of the medical battalion. Ambulances and personnel so detailed are under the immediate control of the regimental surgeon for the duration of the march. When march conditions cease ambulances revert to their normal command status and return to their organizations. If but one ambulance is with the regiment, it follows the headquarters section of the regimental medical detachment at the rear of the column. If additional ambulances accompany the column, they may be marched with the battalion

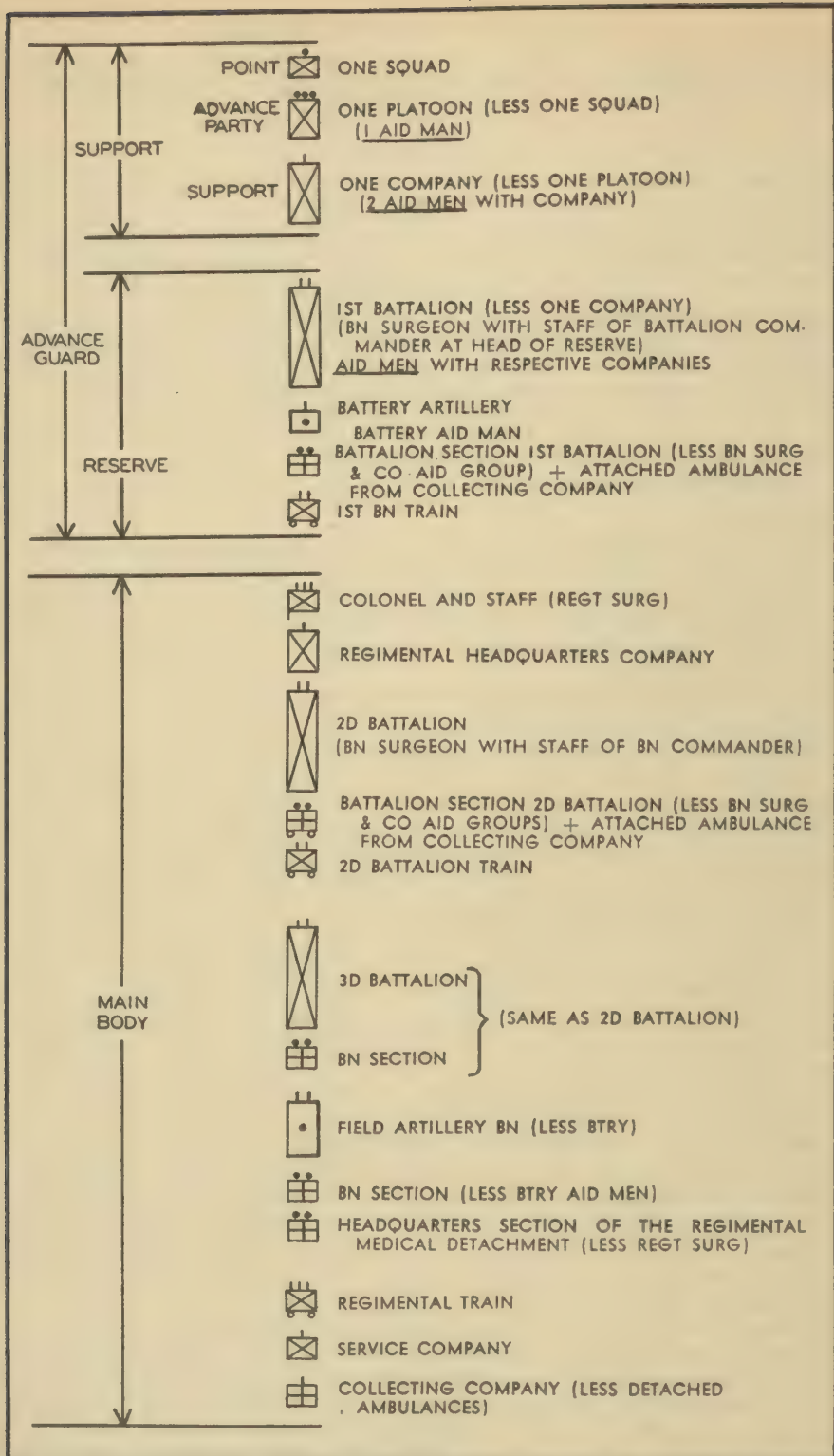


Plate 19. A Suggested Distribution of Medical Detachments with a Combat Team on the March. (An Interior Combat Team, Flank and Rear Protection Furnished by Other Units).

medical sections. The ambulances which belong to the medical detachments of cavalry, field artillery, or other units are similarly disposed of during the march but remain with their organizations.

March Casualties. Sick or disabled are reported to the commanding officer of their unit. The commanding officer usually directs the individual to see the medical officer at the next halt or issues a pass for the soldier to drop out of the column and await the arrival of a medical officer. The medical officer who examines the soldier returns this pass to the soldier's company commander, showing thereon the disposition which he has made of the case.

The medical officer disposes of the soldier in accordance with the conditions found after hasty examination. He may relieve the soldier of his pack and require him to continue the march; he may put him in an ambulance or on any other piece of transportation, for disposition at the end of the march; or he may require him to march at the tail of the column, where he can be kept under observation.

In case the march order provides for march collecting posts, casualties are continued with the column until the next station is reached. If an evacuation point only is designated, casualties unable to continue with the column are left by the roadside or delivered to ambulances in the rear for evacuation.

All casualties separated from their organization are tagged by a medical officer. All arms and personal equipment of sick or disabled remain with them; the mount, saddle equipment, and arms of mounted soldiers are returned to their organizations.



Plate 20. Regimental Dispensary Established in Camp.

Rapidly moving mounted commands, except when provided with ambulances, rarely have transportation for the sick and disabled. March casualties unable to continue with the column may be directed to follow the command at a walk, or they may be sent back toward the main body. It may be necessary to leave them with inhabitants or under shelter, to be picked up and evacuated to the rear by troops following. In all cases it must be left to the judgment of medical officers whether or not casualties should be accompanied by personnel of the medical detachment.

A record of the disposition made of sick and disabled soldiers on the march is kept by the medical officer.

Regimental Medical Detachment with Security Detachments. Combat units forming advance guards, rear guards, and other security detachments are normally accompanied by their attached medical troops. Plate 19 illustrates the manner in which the personnel of the regimental medical detachment may be distributed among the units of an infantry regiment marching with one battalion as an advance guard.

In Camp

The regimental medical detachment camps or bivouacs in accordance with march dispositions.

Battalion, squadron, and regimental dispensaries are established upon arrival in camp.

Only such equipment is utilized as is necessary to permit proper functioning. Sick call is held daily in camp.

Except when acting alone, the regimental medical detachment has no responsibilities as to evacuation of casualties from the regiment. March casualties unable to continue with the column are disposed of at night halts. Evacuation is accomplished by ambulance elements or empty supply vehicles returning to the rear. Ambulances and dispensaries exchange litters, blankets, and other medical property which accompanies the patients.

In Combat (General)

Tactical Employment of Medical Detachments of Infantry Units. In general, the principles herein set forth govern the tactical employment of all medical personnel attached to organizations of combat troops, although they are discussed in respect to service with infantry units.

The tactics of the combat unit is the determining factor in the tactics to be employed by attached medical troops. All operations of the regimental medical detachments in the field have as their mission the rendering of support and assistance to the combat troops. They include the following:

Finding, tagging, and aiding the disabled, and separating them from the able; establishment of aid stations; the collection and treatment of casualties; prevention of unnecessary movement to the rear on account of sickness or injury; preservation of morale by early medical attention and removal of the wounded; examination of the dead and sanitary supervision of their disposal; and preparation of records of dead and wounded.

In order to accomplish the above, the surgeon must be informed of his mission, the military situation, the plan and time of action, zones of action, scheme of maneuver, and the terrain. This knowledge is obtained from his unit commander, through personal reconnaissance, and by the use of maps. He can thereby determine the area of expected "casualty density."

Reconnaissance. Reconnaissance on the part of medical officers is necessary for the efficient execution of medical support in the field. All medical officers should endeavor to make a reconnaissance of the area occupied or to be occupied by their organizations, and to gather such information concerning the territory to the immediate front and rear of their areas as will enable them to prepare plans for the collection, treatment, and evacuation of the sick and wounded in case of a general advance or retirement. Regimental surgeons who find it impossible to complete such a reconnaissance because of insufficient time or of limitations imposed by the enemy should, after battalion medical officers have established their aid stations, make a reconnaissance and suggest to battalion commanders the desirability of any changes. The reconnaissance as made by medical officers is topographical in character and is conducted for the purpose of obtaining the following information:

<i>What to look for</i>		<i>Why</i>
General character of country		Orientation.
High ground		For observation points, to avoid, or to take shelter behind.
The road net		For routes of evacuation to rear.
Ravines and stream beds, trails, etc.		For determination of the natural lines of drift of wounded.
Cover	{ Brush	For shelter from observation and fire; for location of aid stations.
	{ Woods	
	{ Ravines	
	{ Stream lines	

Classification of Casualties. Casualties may be classified as follows:

<i>First classification</i>		<i>Second classification</i>	<i>Third classification</i>
Sick	{ Communicable	Slight Medium Severe	Walking
	{ Noncommunicable		Transportable (Recumbent, sitting)
Gassed			Nontransportable
Wounded			
Dead			

The approximate proportion of killed and wounded and of walking and transportable wounded, in open and in stabilized military operations, is indicated below:

Type of Casualty	Open warfare Percent	Stabilized warfare Percent
Dead	15	20
Wounded	85	80
Able to walk to aid station	(45)	(40)
Must be carried to aid station	(40)	(40)

Estimation of Battle Casualties. In order that proper plans may be made for the collection, treatment, evacuation, and replacement of casualties, an estimate of battle casualties and the determination of expected areas of "casualty density" are necessary. In addition to battle casualties, front line troops of a seasoned command in campaign will have, on any battle day, approximately six-tenths (0.6) of 1 per cent sick and non-battle injured.

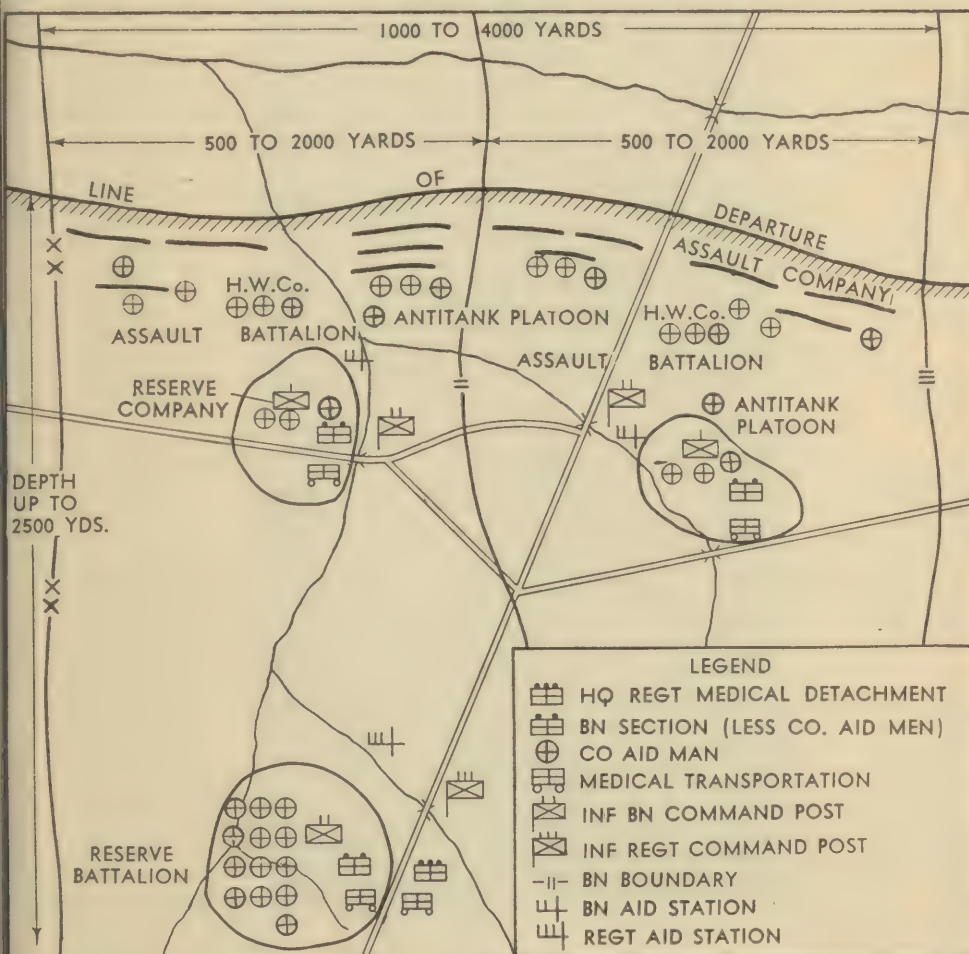


Plate 21. Deployment of an Infantry Regiment for Attack, Showing Frontages, Depth, and Positions of the Regimental Medical Detachment.

Battle casualties will average 12 to 15 per cent per day of severe fighting for an infantry regiment. This figure is approximate; in very severe fighting it has run as high as 35 per cent.

In estimating probable battle casualties, the following facts must be kept in mind: Battle casualties are not ordinarily equally distributed along the front.

The percentage of casualties in certain battalions and companies will be greater than in the regiment as a whole.

Attacking troops usually have more casualties than defending troops.

In the attack the greatest number of casualties will occur in units having the more difficult missions.



Plate 22. Company Aid Man.

In the defense the greatest number of casualties will occur in units holding important points.

Heavy casualties usually occur at stream crossings, road crossings, road and railway junctions, and generally in locations under enemy observation.

An estimate based on front-line divisions engaged will usually be more accurate than if based on a rate for a corps or an army as a whole.

Orders. The field orders issued by the regimental and battalion commanders specify the time of attack, the frontages, the line of departure, the lateral boundaries, and the scheme of maneuver of the unit. In this order the initial location of the aid station is designated by the commander, usually after recommendation and conference with the surgeon.

Surgeons should make sure that they receive a copy of the field order, either orally or in writing, for without this necessary information they cannot intelligently serve their units. The surgeon issues orders to his subordinates, ordinarily in the form of messages or oral instructions. The orders when so issued are usually fragmentary.

Area of Operation. The area of operation of the regimental medical detachments as well as the battalion medical section is the same as that of the respective combat unit served. A diagram indicating the usual frontages and depths is shown in Plate 21.

Functions of the Company Aid Group. Three men from the company aid group of the battalion medical section are attached to each lettered company, 3 to each heavy weapons company, and 1 to the antitank platoon of the battalion headquarters company. The company aid group of headquarters section is attached as follows: 3 to the cannon company and 3 to the antitank company of the infantry battalion. These company aid men follow by bounds in rear of leading platoons; locating the wounded and administering emergency treatment (Field Manual 7-30). They direct the walking wounded to the position of the aid station and place casualties unable to walk in sheltered positions where they can be picked up by litter squads or evacuated later by ambulances. Company aid men send information to the battalion surgeons by messages carried by the litter bearers or walking wounded.

Medical equipment of the Medical Department soldier. The Medical Department soldier carries a medical kit consisting of two pouches, two canteen ring straps and a suspender. The pouches are slung from the suspender straps on the right and left sides respectively. This is the "normal" carrying position.

When the gas mask is worn, which is put on after the medical kit has been adjusted in place, a change in the carrying position of the pouches is necessitated:

(1) All Medical Department enlisted, except litter bearers, will carry the *left* pouch (dressings and emergency medical tags) in *front* of the body fastened by snap hooks to the suspender rings as shown in Plate 22.

(2) Medical Department enlisted men functioning as litter bearers will change the position of both pouches. The *right* pouch (medicine and instruments) is suspended in *front* of the body as described in the preceding subparagraph. The left pouch then is worn at the back attached to the suspender rings. This change is made due to the fact that if the pouches are carried at the sides of the body they interfere with the litter carrying straps and the actual carrying of the litter. The right pouch is carried in front of the body since the litter bearer will, in all probability, have more use for medicines and instruments.

The bottom of each pouch can be extended downward to double its capacity.

Emergency Medical Tag. (Plates 23 and 24). The emergency medical tag is a waterproof linen tag upon which is recorded a diagnosis of the patient's disease or injury, the treatment given, and other essential data. A copper wire is attached to one end, permitting the tag to be fastened readily to the patient's clothing, usually over the breast.

Use. As a sick and wounded record the Emergency Medical Tag (W.D., M.D. Form No. 52b) is prescribed for use in a theatre of operations, and whenever troops move or take the field to engage in practice marches or maneuvers. During or after an engagement it will be attached to all sick, wounded, and dead. In referring to this tag the use of the abbreviation EMT is authorized.

Purpose. For the sick and wounded the primary purpose of the emergency medical tag is to inform the medical officers under whose observation the patient successively comes, of the character of the disability and the treatment previously given at the several points of relief on the field or on the way to the rear.

For the dead the purpose of the emergency medical tag is: to prevent a loss of time by other medical personnel in examining the body; to furnish as much information as is practicable regarding the details of the death.

MILITARY MEDICAL MANUAL

Preparation. The emergency medical tag will be made out by the first Medical Department officer who treats the patient previous to his admission to a hospital, or by the first member of the Medical Department who finds or examines the remains (Field Manual 8-45).

In accordance with War Department Circular No. 182, June 11, 1942, during combat and simulated combat (maneuvers), aid stations and collecting stations of divisional or brigade units engaged with the enemy will partially accomplish the emergency medical tag to show *only* name, grade, Army serial number, date, hour, diagnosis, and treatment given.

NAME AND ARMY SERIAL NUMBER						
NEWTON, JOSEPH L. 7864932						
GRADE		COMPANY		REGIMENT AND ARM OR SERVICE		
Pvt						
DIVISION	CORPS	ARMY	AGE	RACE	NATIVITY	SERVICE, YEARS
STATION WHERE TAGGED:					DATE	HOUR
					Aug 16 1942	1940
DIAGNOSIS: IF INJURY, STATE HOW, WHEN, WHERE INCURRED						
WIA-GSW, Forearm, Left						
LINE OF DUTY						
TREATMENT:						
Iodine, 1st Aid Dressing						
ANTITETANIC SERUM: DOSE				1500 Units	TIME 1940	
MORPHINE:		DOSE		None	TIME	
DISPOSITION:					DATE	HOUR
SIGNATURE, WITH RANK AND ORGANIZATION:						
Harry B. Smith, 1st Lt.						
FORM 52b—MEDICAL DEPARTMENT, U. S. A. (Revised October 25, 1940) 16-15434						

Plate 23. The Emergency Medical Tag, Form No. 52b, Med. Dept. (Partially Prepared in Accordance with War Dept. Circular No. 182, June 1942.)

Form No. 52b, thus partially prepared, will be signed by the person responsible, indicating his grade. (See Plate 23). The space for disposition together with the date and hour will be completed either at the time of partially completing the tag or if the patient's condition requires treatment prior to evacuation to the rear, the space will be filled in at the time of departure from the medical installation.

At clearing stations and other Medical Department establishments in rear of clearing stations, Form 52b will be accomplished completely. (See Plate 24).

The space "STATION WHERE TAGGED" will be completed when the person at the clearing station or other Medical Department installation in rear of the clearing station knows *definitely* the place where the patient was originally tagged.

Under all conditions of service other than indicated above, Form No. 52b, when used, will be accomplished completely.

The tissue paper protecting the carbon sheet will be torn out before the linen tag is written, in order, that the duplicate impression on the paper tag may be made at the same time as the original. A medium hard *black* pencil should be used and special care exercised that the name of the patient or of the deceased is legibly written or printed. After the preparation of the tag is completed the carbon paper separating the original and duplicate tags will be torn out and discarded.

NAME AND ARMY SERIAL NUMBER									
NEWTON, JOSEPH L. 7864932									
GRADE		COMPANY		REGIMENT AND ARM OR SERVICE					
Pvt		A		16th Inf					
DIVISION	CORPS	ARMY	AGE	RACE	NATIVITY	SERVICE, YEARS			
37	V	First	22	W	Mont	1			
STATION WHERE TAGGED:					DATE	HOUR			
					Aug 16 1942	1940			
DIAGNOSIS: IF INJURY, STATE HOW, WHEN, WHERE INCURRED									
WIA-GSW, Forearm, left									
LINE OF DUTY Yes									
TREATMENT:									
Iodine, 1st Aid Dressing									
ANTITETANIC SERUM: DOSE 1500 Units, TIME 1940									
MORPHINE: DOSE None, TIME									
DISPOSITION:									
To Coll Sta					DATE	HOUR			
					Aug 16 1942	2000			
SIGNATURE, WITH RANK AND ORGANIZATION:									
Harry B. Smith, 1st Lt.									
Form 52b—MEDICAL DEPARTMENT, U. S. A. (Revised October 25, 1940) 16-15434									

SUPPLEMENTAL RECORD	
2040, AUG. 16, 1942	
COLL STA	
DRESSING INSPECTED	
TO CLR STA 2100	
<i>Dr. Ward, Capt.</i>	
2215, Aug 16, 1942	
Clr. Sta, 37th Div.	
Dressing Inspected	
Morph Sulph. .016 gm.	
To 10th Evac Hosp 0030	
<i>J. C. Black, Capt.</i>	
0400 AUG. 17, 1942	
ADMITTED 10th EVAC. HOSP.	
<i>C. F. Good, Capt.</i>	

Plate 24. The Emergency Medical Tag, Form No. 52b, M.D. (Front and Back).

When not in combat, the tag will be prepared with the same care as to detail as is required in the case of the register card (Form 52, M.D.). Under the "Diagnosis" will be recorded the essential facts concerning the character of disease or injury, such as fracture, the parts involved, the cause, and severity. In combat there will be many instances when the initial preparation of the tag will be faulty. The tags will be examined by medical officers along the route of evacuation, and every effort consistent with the well-being of the patients will be made to complete and correct the entries. In the case of wounds, received in action with an enemy of the United States, or as a result of an act of such enemy, the diagnosis will include a statement to that effect recorded as "Wounded in action" (WIA) and in the case of the dead found on the field, the entry "Killed in action" (KIA) will be made, it being understood that these are administrative rather than medical entries and that a complete diagnosis is required. It is important to remember that awards of compensation and decorations are dependent upon this record. See AR 600-45, and AR 600-95.

Under "Treatment" will be noted the dressing applied and whether operation or special treatment is urgently needed. The administration of morphine or antitetanic serum will be noted in the separate spaces provided for that purpose.

Under "Supplemental record," on the back of the original, will be recorded as the case may require:

The additional treatment given *en route* to hospital, indicating its nature and where and when it was given.

The fact, time, and place of death and other essential attending circumstances, if the patient dies while *en route*.

The hospital where the patient was admitted for definite treatment, or the disposition of the body.

The fact that the soldier is returned to duty from any station along the route of evacuation, prior to admission to a hospital. All entries will be signed.

Abbreviations. The abbreviations listed below are authorized for use only on emergency medical tags and field medical records in the diagnosis space. No additions to or deviations from this list of abbreviations will be permitted. In the nonmedical entries, abbreviations authorized by the War Department may be used.

CW—Contused wound.

EW—Extensive wound.

FUO—Fever of undetermined origin.

FC—Fracture compound.

FCC—Fracture compound comminuted.

FS—Fracture simple.

GSW—Gunshot wound.

IW—Incised wound.

KIA—Killed in action.

LW—Lacerated wound.

MW—Multiple wounds.

NYD—Not yet diagnosed.

Pen W—Penetrating wound.

Perf. W—Peforating wound.

Pun W—Punctured wound.

SV—Severe.

S—Slight.

WIA—Wounded in action.

How attached. The original tag will be torn from the book and affixed to the clothing of the patient (or clothing of the dead, as the case may be) over the breast, or as near to it as possible, so as to be readily seen.

Use in transfer of patient. An emergency medical tag will be attached to every patient transferred to a hospital from an aid station, dispensary, or establishment other than a hospital, in a theatre of operations or whenever troops move or take the field to engage in practice marches or maneuvers. The tag will serve the same purpose as the transfer card prescribed for use in time of peace or in the zone of the interior in time of war. Only one emergency medical tag will be attached to any patient. All necessary notes, before admission to hospital, will be made on the one tag.

Use by moving commands. For commands moving, or in the field in time of peace, or for commands on a similar status in the zone of the interior in time of war, the emergency medical tag will be used by the senior medical officer of each command or dispensary in lieu of a report card for all cases terminated by death or returned to duty during the month. Any patient who is transferred from such commands to a hospital will be accompanied by an emergency medical tag. If a patient is transferred to other than an Army hospital, request will be made by the transferring officer that the hospital diagnosis, the complications, operations, and disposition, with dates, be entered in the supplemental record, that the tag accompany the patient if he is removed to an Army hospital, and that it be mailed to The Surgeon General, War Department, Washington, D. C., if the patient is released from the hospital to duty.

Each emergency medical tag received with transferred cases by a hospital which is part of a field force, will be placed in the field medical jacket and will thereafter form a part of the patient's field medical record.

Use of the EMT for those "killed in action." The term "killed in action" includes those who meet sudden death as a result of battle injuries and all casualties who die before receiving treatment by a medical officer or before reaching a medical installation. Battle injuries are defined as those wounds caused by primary or secondary missiles, or by chemical agents, set in motion by the hostile act of a military enemy. Wounds or injuries from projectiles dropped by enemy airplanes at considerable distances from the operations of ground troops, and those resulting from enemy torpedo attacks on ships, are properly included among battle injuries.

Whenever practicable a noncommissioned officer or a qualified private of the medical department should accompany all burial parties and prepare emergency medical tags for all the killed in action not previously tagged. Medical Department personnel attached

to units of the Graves Registration Service will prepare EMTs if missing at initial interments and complete or correct such as are faulty.

Contents. On each tag the army serial number, name, and rank of the deceased (the data being obtained from the identification tag attached to the body) will be written clearly and legibly. In addition to the diagnosis of killed in action (KIA), there should be entered when practicable, a brief note showing the location of any wounds, such as head, chest, abdomen, arm, forearm, hand, thigh, leg, or foot, with side involved and the character of the causative missile, such as shell, shrapnel, bullet, bayonet, saber, bomb. In case a tag is incomplete in the foregoing or any other particular, Medical Department personnel on duty with the Graves Registration Service or with other burial parties will supply the missing information if it is obtainable. If identification is impossible at time of interment, notation will be made of the Graves Registration Service registration of the body in order that The Surgeon General may have a means of securing additional information at a later time.

Disposition of the originals. The original emergency medical tags of the sick and wounded who are *returned from aid stations to their organizations* without going farther to the rear, will be removed at the aid station and retained for use by the regimental surgeon.

The original emergency medical tags of the sick and wounded who are *returned to their organizations direct from a station on the route of evacuation* will, upon their reporting for duty, be removed for use by the surgeons of their respective organizations. Such tags will be collected and forwarded by the senior medical officer of the establishment or command by whom they are removed with the next ensuing monthly report of sick and wounded.

The original emergency medical tags of the sick and wounded who are *admitted to a hospital which is part of a field force* will be removed and placed in the jacket of the field medical record. Original emergency medical tags received with patients evacuated to a hospital which maintains a register of sick and wounded will be removed, the fact of receipt and date thereof entered in the supplemental record, delivered to the registrar, and forwarded to The Surgeon General with the next report of sick and wounded. If an EMT, is the only field record received with a patient evacuated from a theatre of operations to a hospital for definite treatment in the zone of the interior, it will be forwarded to The Surgeon General within twenty-four hours.

The original emergency medical tags attached to the bodies of sick and wounded who *died while in transit*, or of the *killed in action*, will remain attached to the bodies until interment takes place. See AR 30-1805, 30-1810, 30-1815. If interment is under supervision of the Graves Registration Service, the EMT will be removed by Medical Department personnel and forwarded to The Surgeon General with the next report of sick and wounded. If interment is not under the immediate supervision of the Graves Registration Service but is made by burial parties from the command, the tags will be removed by Medical Department personnel if present, otherwise by responsible persons and transmitted to the surgeons of the commands of which the dead were members. The EMT attached to the body of enemy or allied dead will be forwarded to The Surgeon General through such channel as may be prescribed.

After the tag is detached from the patient the wire will be removed from the tag.

Disposition of carbon copies. The carbon copies of the emergency medical tags will be assembled and utilized by the senior medical officer of each unit to prepare for the organization commander such a daily list of casualties as may be required in preparing or checking his reports. At the end of each month all the carbon copies, having served the purpose indicated, will be collected and forwarded with the monthly report of sick and wounded to the chief surgeon for transmittal to the surgeon general. (see Chapter VIII).

Litter Bearer Group. This group is charged with the prompt removal of all seriously sick and wounded from the fighting line and their evacuation by litter to the site of the aid station. Litter bearers direct and assist the walking wounded to the aid station. When necessary, a litter bearer squad searches for, treats and cares for the sick and wounded.

The litter bearer group assists the aid station group of its battalion medical section in moving and establishing the aid station.

When the action commences, the litter bearers move forward from the aid station and make contact with the company aid men. They operate along the axis of advance of the companies in the assault echelon of the battalion, evacuating the wounded. They take advantage of the ground and cover, utilizing available covered routes, such as stream beds or ravines, from the location of assault companies to the aid station. These routes are known as "natural lines of drift."



Plate 25. Two-Bearer Litter Squad Carrying Wounded.

The litter bearers serve as messengers between the battalion surgeon at the aid station and the company aid men and vice versa.

Hand litter-carriage is fatiguing work, and casualties among litter bearers are quite numerous. Because of hostile fire, and the laborious task, "evacuation lag" may begin at this point, causing the first interruption in the patient's journey to the fixed hospital. The twelve bearers can handle only three casualties on each trip. It may be necessary to supplement the litter bearers by requesting a detail of prisoners of war, or even riflemen to assist in carrying wounded from the field. Combat troops will be detailed on evacuation duty only as a last resort and only when such employment does not interfere with their combat duty.

Battalion Aid Stations. Battalion aid stations are operated by aid station groups. The principles governing the establishment and operation of battalion aid stations are:

Battalion aid stations are established in combat when there is no steady progress or when progress is very slow.

Only such part of the aid station is established as immediate circumstances require or for which imperative need can be foreseen.

Personnel operating aid stations must keep in constant contact with the combat units they serve.

The aid station group prepares casualties for further evacuation. The aid station is not a proper place for the initiation of elaborate treatment of surgical cases. The treatment given should be such as will not retard the flow of casualties through the aid station.

Medical property evacuated with patients must be replaced by exchange with the next medical unit to the rear.

The main functions are: sorting of the wounded; rendering of emergency treatment or supplementing treatment already given; tagging; and keeping a record of the sick and wounded.

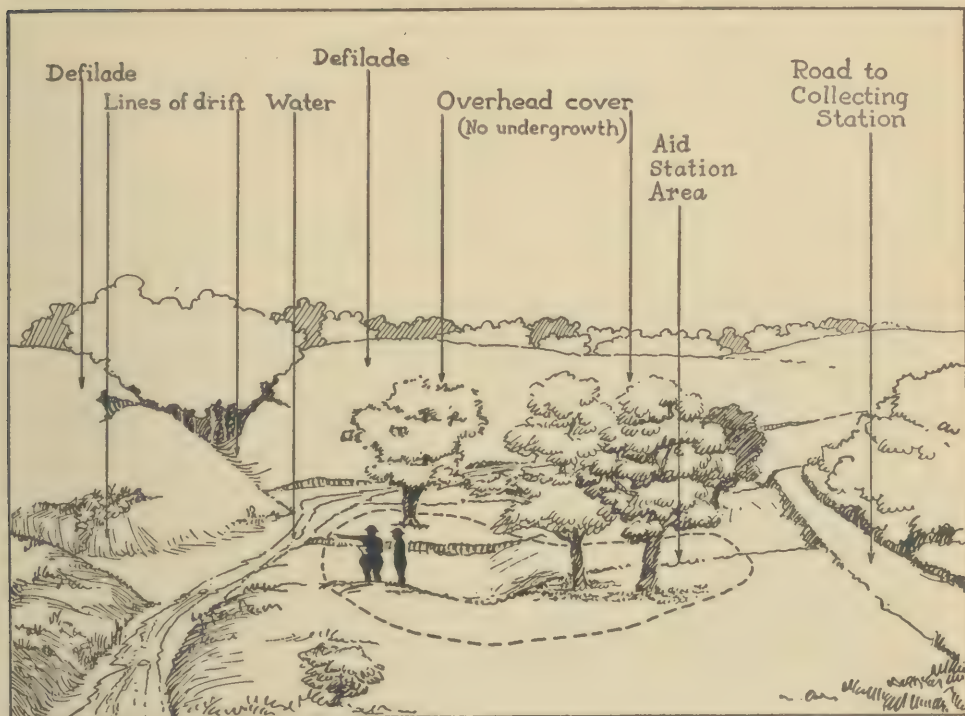


Plate 26. A Desirable Aid Station Site.

Selection of aid station sites. The ideal site for an aid station is a sheltered location at the center rear of the unit served, between 300 to 800 yards (there is no prescribed distance) from the front line, with covered routes of movement front and rear, and a supply of water. In the selection of the actual aid station sites, the following features should be kept in mind:

Desirable

Shelter from enemy fire and observation.
Proximity to natural lines of drift of wounded.
Ease of contact with combat troops.
Ease of communication with the rear.
Economy in collecting and litter bearing work.
Ease of advancement of station to front or rear.
Proximity to water.
Protection from the elements.
Use of lights at night (yet invisibility from enemy on ground or in air).

Undesirable

Enemy observation and fire.
Close proximity to bridges, cross roads, ammunition dumps, ration distributing points, artillery positions, and permanent landmarks.

To select the proper site for an aid station, the battalion surgeon must make an estimate of the situation which includes: the disposition, strength, and mission of the troops to be served by the battalion aid station; whatever is known of the enemy and his capabilities; nature of the terrain involved. (See Chapter VII).

The tactical employment of the combat units served is the determining factor in the selection of the aid station site; therefrom, the battalion surgeon can determine the localities where the bulk of the wounded ("areas of casualty density") will probably be found. Consequently, he will attempt to place his aid station behind these localities.

The site is finally decided upon by the battalion commander, upon recommendation of the unit surgeon. This is essential to avoid any disagreement or conflict with other installations of the battalion or units attached or in support thereof.

Interior arrangement of the aid station. The space in which the aid station is established should be allotted to the various activities of the station in such a way as to permit their functioning in the most efficient manner. At the entrance to the aid station site is located a receiving space or area; at the opposite end, a forwarding space. In the receiving space is the record clerk who keeps a blotter of casualties. Ample space should be assigned for dressing cases. A space should be provided where hot drinks may be prepared for the wounded. A suitable layout for an aid station in a tent or area is shown in Plate 27. It must be remembered that this is purely *diagrammatical* and in no way indicates a definite arrangement, since in combat consideration must be given for separation of operating personnel in order to avoid excessive casualties by a shell or bomb exploding within the station area. Grouping of the personnel and the equipment should be prohibited except as necessary for operation.

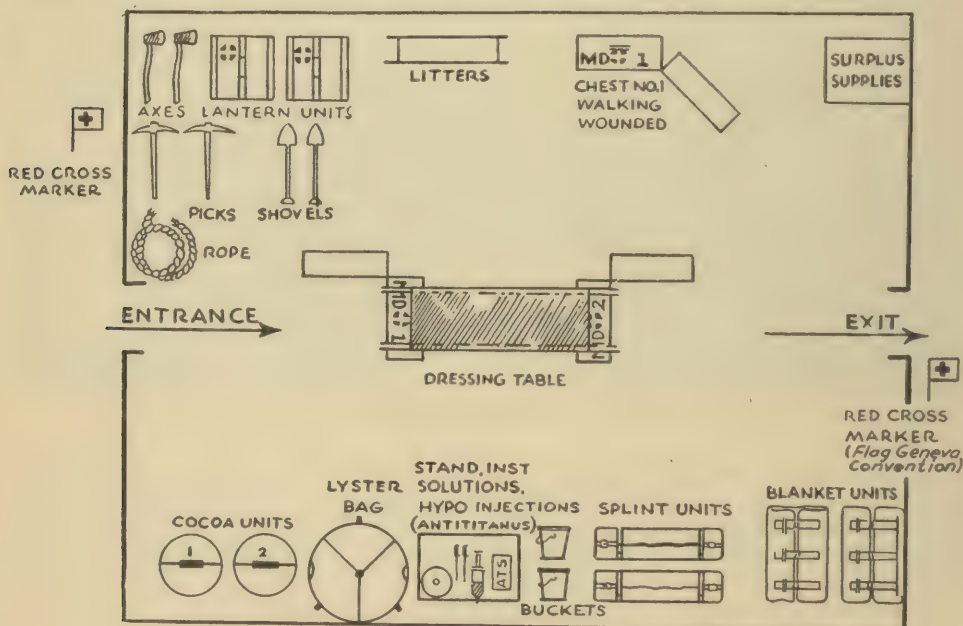


Plate 27. Conventional Floor Plan of an Aid Station.
(As established in a building or tent).

Functioning of the Aid Station. The aid station is the beginning of the route of evacuation. To it the battalion medical section litter bearers bring the wounded they have collected from the combat companies. At this station the wounded are dressed, tagged, sorted, and returned to their companies or made ready for further evacuation to the rear.

Sorting is an important function. Malingers and those with slight wounds are returned to their companies. Men disabled for combat but able to walk are directed to the

collecting station evacuating the aid station. This is best accomplished by having them follow litter bearers from the collecting company. Seriously wounded men are turned over to litter bearers from the collecting company to be carried to the collecting station.

Only *emergency treatment* is given at the aid station. Hemorrhage is arrested, bandages readjusted, antitetanic serum administered, and emergency medical tags attached and verified. For example, patients arriving at the aid station, who have received emergency treatment from a member of the company aid group or of the litter bearer group, have their dressing inspected and receive further treatment indicated. Wounded able to walk will arrive at the aid station without having contacted on their way to the rear either the company aid men or the litter bearers. Some of these casualties will have applied the dressing from their own first aid packet. These casualties will be attended as necessary for further evacuation. Surgical operations are rarely attempted except for those cases where immediate operation is imperative to save life or to insure future recovery.

Records are kept of all cases passing through the aid station. The total casualties on the blotter are frequently noted and the battalion commander and regimental surgeon kept informed as to the losses. The station blotter is simply a note book showing the designation of the individual, the nature of his wound or wounds, and the disposition made of the case, such as: duty, collecting station, or died.

The regimental medical detachment is not responsible for evacuation to the rear but does cooperate in maintaining contact with the collecting company through the contact agent who has been sent forward from the collecting company for that purpose.



Plate 28. An Aid Station in Operation (Litter Wounded Department).

The Regimental Aid Station. The regimental aid station is established by the headquarters section of the regimental medical detachment to render medical service for all personnel in and about the regimental command post. This station is established only as required in any given situation. It is not normally a link in the evacuation of wounded from battalion aid stations. When establishment is not indicated, all personnel and equipment are held in regimental reserve. Partial or complete establishment of the regimental aid station may be indicated to care for the situation while the battalions of the regiment accompanied by their respective battalion medical sections are moving for-

ward to their positions in line. This permits the battalion medical section to keep mobile, conserve the strength of its personnel and maintain contact with the infantry battalion it serves.

Communication Available for the Regimental Medical Detachment. In battle, it is often very difficult to locate and maintain communication with other elements in the chain of evacuation. Responsibility for communication, or contact, is normally from rear to front.



Plate 29. Another View of the Aid Station (Walking Wounded Department).

Within the regimental medical detachment, contact is made as follows:

Between regimental and battalion surgeons, by personal contact or by runner from the headquarters section of the regimental medical detachment.

Between battalion surgeon and battalion commander, by personal contact or by a messenger from the battalion medical section stationed at the battalion command post.

Between aid station and forward companies, by litter bearers, by messages from company aid men, or by walking wounded.

Between aid stations and collecting companies of the medical battalion, ordinarily by contact agent from the collecting company and litter bearers from the collecting company. While the collecting company has the responsibility of making and maintaining contact with the aid stations, the battalion surgeon takes all necessary precautions to insure that such contact is made and maintained.

Reinforcement and Replacement of Personnel. By authority of the regimental commander, the regimental surgeon may transfer individuals from one battalion medical section to another in order to meet existing conditions. He may request reinforcements for his detachment when he foresees the need. All surgeons are authorized to call upon the next medical unit in rear for replacement of personnel, and that unit furnishes such personnel as can be spared. This procedure then extends to the next medical unit in the rear.

Supplies and Equipment. *In combat*, commanding officers, both of unit detachments, and of battalion sections thereof, will procure all supplies, *except* medical, through the channels provided for other elements of the unit. They will procure *medical supplies* by:

(a) Informal request sent to the medical unit in direct support, ordinarily a collecting company of the medical battalion. The supplies will be delivered by litter bearers, or ambulance may be used in some situations, such as during hours of darkness.

(b) Informal request sent to the nearest medical distributing point.

(c) The same manner as set forth when not in combat (see below).

(d) Any combination of the methods outlined above.

In other than combat, the commanding officer of the detachment is responsible for its supply. He submits to the unit supply officer the requirements of all articles of equipment authorized in Tables of Basic Allowances.

In Attack

Plans for the Employment. In attack situations, conditions usually will permit the making of complete plans for participation by the regimental medical detachment. The regimental commander's plan of action should be carefully studied, coordination with the combat units provided for, and detailed plans covering all phases of the medical detachment's participation in the action carefully formulated.

Employment of the Headquarters Section of the Medical Detachment. The headquarters section of the medical detachment should be held in a position in readiness near the regimental command post. In certain situations it should retain its full mobility and be prepared to supply and reinforce the battalion medical sections serving the battalions of the regiment. Supplies should be made available for the care of such casualties as may occur in the vicinity of regimental command post. In certain other situations the regimental aid station is established early in order that care and treatment may be given the wounded during the initial stages of the advance and before the establishment of battalion aid stations has been effected. In that capacity it assists in keeping the battalion medical sections mobile, allowing them to follow their respective battalions in the attack.

Establishment of the Battalion Aid Station in Attack. The battalion medical sections follow their respective battalions into position. Aid stations are fully or partially established in the most advantageous positions to serve their respective battalions. If a strong and well maintained resistance is expected, aid stations should be located on or slightly to the rear of the line of departure. When the enemy is weak, and when little resistance is expected, the aid station group may follow the attacking troops forward from the line of departure some distance before establishing an aid station. Such action tends to diminish the work of the litter bearers during the early stages of the action and may make early movement and reestablishment of the aid station unnecessary. Premature establishment of the aid station should be avoided. Ordinarily, equipment should not be completely unpacked until wounded arrive; otherwise with the changing aspect of the battle, the aid station might, be immobilized in a place where it could not realize its full usefulness.

Company Aid Men in Attack. Company aid men (3 to each rifle company) follow the companies into action. Companies often attack with 2 platoons in the assault echelon and 1 platoon in support. Company aid men attached to companies take position to the immediate rear and center of each platoon in the assault echelon and in so far as is practicable maintain this position throughout the attack.

The duties of the company aid men during the attack are as follows:

Maintain contact with the companies to which attached,

Forward information to their respective battalion surgeon by litter bearers or by wounded able to walk. This information will include progress made by their companies, the exact location of the company on the ground, and the approximate number of casualties occurring in each company.

Administer emergency treatment, and mark the location of the casualty by means of the individual's rifle or bayonet stuck in the ground, and his headress or a piece of bandage hung from the upper end,

Examine and tag the dead, and mark the location as described above.

Instruct the sick and wounded able to walk of the exact location of the aid station and the proper route thereto,

Place all seriously sick and wounded on the central axis of the advance of the company. Advantage should be taken of sheltered positions.

The position of the seriously wounded left on the axis of advance may or may not be marked, depending on standing orders and the ability or inability of the enemy to observe such procedure. Wounded requiring movement to the axis of advance or to protected positions on the terrain will be attended to as time permits.

Company aid men attached to the *heavy weapons company*, the *cannon company*, and *antitank units* may be widely separated and unable to work together. For this reason they should be given more detailed instructions and taught to work independently. In general, they function in the same manner as do company aid men attached to the rifle companies of the battalion.

Litter Bearer Group in Attack. As soon as action commences the litter bearer squads of the battalion medical section move forward from the vicinity of the aid station with instructions to follow along the axis of advance of the battalion, to make contact with company aid men when this can be accomplished and to clear the battle area of all wounded. As the attack progresses, litter bearer squads operate along the axis of advance of each company in the assault echelon of the battalion, evacuating the wounded to the aid station.

Where distances are short the litter bearer group may use six litters (2 bearers to a litter), but when the distances are long, four bearers should be assigned to each litter.

When additional litter bearers are attached to the regimental medical detachment, the regimental surgeon may hold the additional bearers as a reserve. Squads can be sent forward as needed. One or more squads may be attached to each battalion medical section or all may be assigned to one battalion medical section when their need is anticipated.

Employment of the Regimental Medical Detachment During the Progress of the Attack. As the attack progresses, the battalion medical sections move forward in order to maintain contact with the battalions they serve and to reduce the length of the litter-carry. The aid station may move in two parts by "leap-frogging," or it may, if clear of patients, follow its battalion intact. During rapid movement, the wounded, after having been given emergency treatment, may be left at the site where treated. The collecting company of the medical battalion as it moves forward will then care for and evacuate these wounded.

When the combat regiment attains its principal objective, combat activity often diminishes and the troops proceed to the consolidation of their new positions, pending orders to resume the attack or initiate pursuit, or to take up the defensive in the positions they have reached. During this period the regimental medical detachment clears the regimental area, checks all medical supplies, and sends requests to headquarters regimental medical detachment for replacements.

Further activity of the medical detachment depends upon the continuance of the attack or other tactical plan. If the attack is continued the employment of the regimental medical detachment conforms to the foregoing. If the combat troops take up defensive action in their new positions the medical detachment is employed as in the defense. If the troops withdraw from the newly obtained positions the medical detachment is employed as stated in the discussion on retrograde movements.

The accompanying table illustrates the various dispositions of the battalion medical section serving an infantry battalion during the attack.

DISPOSITION OF THE BATTALION MEDICAL SECTION IN THE ATTACK

*Infantry formations**Medical section formations*

1st Phase. Advance in route column and development. Column of threes.	Company aid men with companies to which attached. Aid station group, litter bearer group, and trucks follow in rear of battalion.
2d Phase. Approach march (desultory shelling). Lines of small columns, usually squad columns.	Company aid men with companies to which attached. Section, less aid group, follow the battalion reserve. Aid station equipment transported by truck or by hand.
3d Phase. Approach march, and deployment (heavier shelling and long range machine gun fire). Usually squad columns, occasionally infiltration, and skirmish lines.	Company aid men follow closely the assault companies to which attached. Battalion surgeon makes local reconnaissance for aid station site. Aid station group held in position of readiness. Litter bearer group follows the axis of advance of the assault companies.
4th Phase. Advancing the attack (heavy fire of all kinds). Attack formations; usually skirmish line, occasionally infiltration.	Company aid men follow the assault companies to which attached. Aid station group in position of readiness or establish station. Litter bearer group follows assault companies.
5th Phase. Assault. Attack formations.	Company aid men temporarily held up in rear of assault companies. Aid station established. Litter bearer squads follows assault companies.
6th Phase. Reorganization to continue the attack. Temporary defensive formation. Security detachments.	Company aid men join companies to which attached. Aid station prepares to move, or moves forward to obtain closer contact. Litter bearer squads clear area of wounded.
7th Phase. Pursuit. Approach march or attack formations.	Company aid men with companies to which attached. Litter bearer squads follow the axis of advance of the battalion. Aid station group moves forward in close contact with the rear elements of the battalion.
8th Phase. Organization of the ground (in lieu of pursuit). Defensive formations.	Company aid men with companies. Litter bearer squads maintain contact with company aid men and continue evacuation of sick and wounded. Aid station is established in most suitable location.

In Defense

Defensive situations usually afford time and opportunity for a thorough organization of the medical service within the area occupied by the regiment. In this type of action certain special features enter into the administration of the medical service, these becoming particularly important in a prolonged defense of a zone and of less importance as the defense becomes more temporary in character. There is usually sufficient time for a systematic reconnaissance of the entire area occupied by the regiment and for the preparation of medical plans of operation. Dispositions should be made in such a manner as to give efficient medical support and at the same time permit relief and rest, of

medical personnel. All positions should be progressively improved from the hour of occupancy. When necessary, shelter is constructed for aid stations and overhead cover provided as a protection to stations, equipment, and personnel.

Headquarters Section of the Regimental Medical Detachment in Defense. The regimental surgeon's office and the regimental aid station are located in the vicinity of the regimental command post, the extent of the aid station establishment being determined by the duration of the defense, the distance of the position from the front, and whether or not the station is to constitute a link in the chain of evacuation of casualties from the regiment.

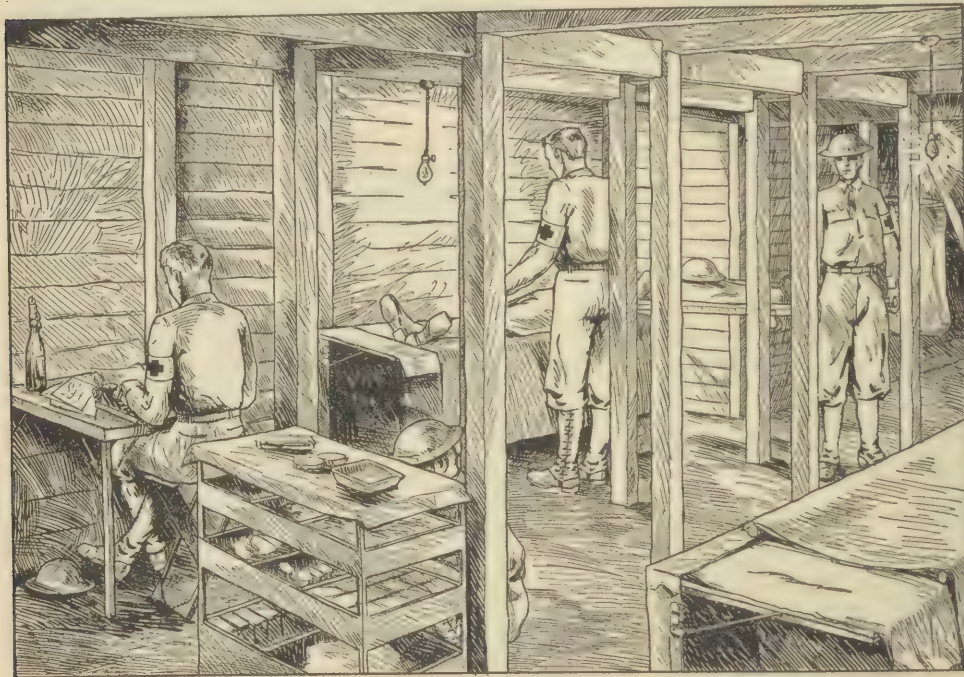


Plate 30. Aid Station in a Dugout Shelter (Stabilized Warfare).

Battalion Medical Section in Defense. The *aid station group* establishes the aid station in a rear position of the battalion center of resistance in the best obtainable location. The distance of such positions from the front is dependent upon the dispositions of the combat troops, the nature of the terrain, and the natural lines of drift for casualties from the front.

The *litter bearer group* of each battalion medical section makes and maintains contact with company aid men with the combat companies, and evacuates by litter all casualties unable to walk to the aid station.

The *company aid men* remain with the companies to which they are attached, and when the situation permits they establish *company aid posts* within the company area. Such aid posts will contain little equipment other than a few dressings and possibly a litter. These posts constitute points where the company casualties may be given emergency treatment through the combined efforts of the company aid men. During the defense, it is desirable that one of the company aid men from each company report in person at least once daily to the aid station maintained by his battalion medical section for the purpose of giving information and obtaining instructions.

Contact with Battalion Commander. The battalion surgeon should maintain close contact with the battalion commander. Large patrols may be sent out, and raids at night may be made into the enemy's position for the purpose of obtaining prisoners and infor-

mation. The surgeon should have full information concerning such activities to enable him to cooperate in the best possible manner and to provide care and evacuation for the casualties which may result. A defense often terminates in some other type of action, therefore medical officers must inform themselves concerning the general military situation and the plans of their respective commanders.

In Retrograde Movements

A retrograde movement is any movement of a command to the rear, or away from the enemy. This includes withdrawal from action by day or night, delaying action, and retirement. See Chapter V, Part I. It is a planned action to improve the tactical position of the command.

Regimental Medical Detachment in Retrograde Movements. The extent of the employment of the medical detachment during a retrograde movement is influenced by the manner in which the movement is accomplished, the activities of the enemy, the strength of the covering force, the location of the covering positions to be occupied, the location of the assembly area in the rear, the rapidity of troop movement, and the effectiveness of the delaying action. Sections of the regimental medical detachment maintain contact with and continue to render medical support for the organizations which they serve.

Headquarters section of the regimental medical detachment. The headquarters section remains in close contact and continues to serve regimental headquarters personnel. If already established at the beginning of a retrograde movement, the regimental aid station may become a very important link in the chain of evacuation of casualties. If not established all station equipment should be packed and the headquarters section should be prepared to move to a new position without delay. During phases of the movement the headquarters section may be called upon to augment the work of the battalion medical sections or to establish an aid station at some point in the rear through which to evacuate casualties from the regiment.

Battalion medical section. The battalion medical sections remain in contact and continue to serve their respective battalions. If the covering or delaying position is occupied by a battalion it is accompanied by its respective battalion medical section. The battalion aid station is partially established well to the rear of the position, providing the defense is relatively strong and the hostile pursuit slow and weak. If the reverse is the case the battalion medical section serving the battalion will be able to accomplish little more than emergency treatment of casualties and their removal to a designated collecting point, preferably near a roadway over which troops pass in proceeding to the rear. The battalion medical section transportation is held at or conveniently near the site of the aid station, and every effort is made to keep it mobile.

In withdrawal from action the movement of battalion medical sections or squads thereof, serving units in contact with the enemy, conform to the movement of such units. If the movement is rapid no attempt is made by the *aid station group* to establish a station, but selected collecting points should be designated along the battalion's axis of withdrawal. The aid station groups of battalion sections occupy such points and provide emergency treatment for the largest possible number of casualties. As units in contact with the enemy approach these points in their withdrawal the positions are vacated and the aid station groups proceed to the designated *collecting points* next in the rear, taking with them the seriously wounded. Every effort is made to prevent large numbers of wounded from falling into the hands of the enemy. Abandonment of living casualties to the enemy is always destructive of morale even when it is not inhumane. In warfare against uncivilized people it is not considered even in desperate situations; and this has often been a limiting factor in operations against barbarous tribes. In rapid retrograde movements it is frequently impossible to evacuate all casualties with the facilities at the disposal of the medical service. In such a situation one or a combination of only three courses of action is possible: the speed of the movement may be retarded to permit evacuation with the facilities at hand; the medical service may be reinforced; or the casualties may be abandoned to the enemy together with a detachment of medical troops sufficient for their care. *This is a command decision.* It is the duty of the surgeon to present to the commander the data necessary for him to

arrive at his decision, but the *commander* alone must decide whether or not to abandon his casualties in whole or in part.

When the delaying positions are occupied by one or more companies, such companies are followed into position by the *company aid men* originally attached, who combine their efforts, establish collecting points for the sick and injured, and care for the casualties in the same manner as prescribed for troops in a defensive action.

When the battalion medical section is divided, the battalion surgeon may order the assistant to direct and supervise the work of isolated groups of medical personnel, *company aid men*, and *litter bearers* of the section. The litter bearers will bring as many casualties to the designated collecting points as they are able to transport.

Contact with collecting station. It is highly important in all retrograde movements that the collecting company charged with the evacuation of the sick and wounded from the regimental area maintain close contact with aid stations and *collecting points* established by the regimental medical detachments.

With Troops Not in Contact with the Enemy. Troops not in contact with the enemy, or occupying selected covering positions, proceed to the designated assembly point accompanied by their attached medical personnel. The disposition of such medical personnel conforms to that prescribed for normal march formations.

Following the Retrograde Movement. Following the retrograde movement the regiment may occupy a new defensive position, or the movement may simply initiate a retirement. If the troops occupy a defensive position or delaying position the regimental medical detachment is employed as in defense, arriving at the new positions at the same time as the unit served. If the movement initiates a retirement the employment of the medical detachment conforms to the principles as prescribed for troops on the march.

EMPLOYMENT OF THE ATTACHED MEDICAL PERSONNEL WITH UNITS OTHER THAN INFANTRY

The basic principles for the tactical employment of regimental medical detachments attached to regiments of infantry are, in so far as practicable, applied in the control of regimental medical detachments of regiments of field artillery, cavalry, and other arms. Similarly, the basic principles of interior organization, tactical employment of regimental medical detachments of infantry, cavalry, and field artillery regiments in garrison, on the march, in camp, and in combat are followed in the interior organization and tactical employment of medical detachments attached to *quartermaster units* and *combat engineer battalions* of the infantry division. There are exceptions however in the armored division. See below.

Artillery

The Medical Detachment With Division Artillery. For tactical employment in the field, the medical detachment supporting the division artillery is divided into a headquarters section and four battalion medical sections (one section for each battalion). See organization of the medical detachment, division artillery (T/O 6-10).

In Garrison and on the March. With troops in garrison, on the march, or in permanent or semi-permanent camps, the service rendered by the medical detachment attached to the division artillery is the same as for regimental medical detachments attached to infantry regiments.

Headquarters Section of the Medical Detachment. In combat the headquarters section of the medical detachment and aid station are established at or near the rear echelon of division artillery. From this position the surgeon maintains contact with artillery headquarters and with each battalion medical section, supervising, reinforcing, and to a limited degree supplying these latter units with medical supplies and material. The *aid station* is established by personnel of the headquarters section and may or may not constitute a link in the chain of evacuation of casualties from the battalion aid stations.

Battalion Medical Section. Battalion medical sections follow their respective artillery battalions into position, establish aid stations, and make contact with their respective battery aid groups. The *battalion aid station* sites should conform to the same requirements

as those of the infantry battalion. They should never be established near ammunition dumps or in close proximity to the designated parking places for artillery caissons and combat trains. They may be established near roadways, but not at important points such as road junctions and crossroads. A road leading to or from the immediate vicinity of the aid station is highly desirable, since this allows evacuation by ambulance. With few exceptions, as related in paragraphs below, aid stations of artillery units function in the same general way as do aid stations serving infantry units. Ambulances are normally part of the medical detachment transportation and, therefore, may be used to evacuate patients from the battery positions (when practicable) and from the aid station to facilities of the medical battalion serving the division. In some instances the aid station may be so located as to be readily accessible to ambulance service of the medical battalion.

Litter bearer group. All sick and wounded unable to walk must be evacuated from battery positions by the litter bearers or by additional help from the aid station group or company aid group when unusual activity develops or when the litter-carry is long. The litter bearers are a part of the battalion aid station group and when not employed as litter bearers they assist in the aid station. In favorable situations the sick and wounded may be evacuated directly from battery positions by ambulance. Ambulances are normally part of the transportation of medical detachments of artillery.

The battery aid group. Battery aid men are attached to each battery of artillery. They are the first to see the sick and wounded in battery positions. They give emergency treatment and care for the sick and wounded until they can be evacuated. The battery aid men eat and sleep with the personnel of the artillery batteries to which they are attached during periods of activity and return to their respective battalion medical sections only at such times as the battalion is brought together for rest or training. They are trained and instructed in the same manner as are company aid men attached to companies of infantry. When a battery remains in one position for a considerable period of time battery aid men obtain a small surplus of medical supplies with which to establish local *aid posts* within or nearby their respective battery positions. Each battery aid man is instructed to care for the casualties occurring in his own battery, and for the accomplishment of this work takes position in or close to the gun emplacement of his particular battery when the guns are being fired or when the position is being fired upon by the enemy. Casualties occurring in gun pits are immediately removed to a place of greater safety, given emergency treatment, and carried by litter bearers or directed to the battalion aid station. In all stabilized or partially stabilized situations it is desirable that battery aid men report at least once daily at the battalion aid station for the purpose of giving information and receiving instructions.

The Veterinary Section (For Horse-drawn or Mounted Units). The veterinary sections furnish veterinary service for all units within the combat zone having animals as part of their organization.

Veterinary Aid Station. The veterinary aid station is operated by the veterinary section. In situations where two veterinary aid stations are needed, the two battalion sections are separated, and each operates a battalion veterinary aid station. The functions of and the principles governing the establishment and operation of veterinary aid stations follow closely these applicable to the medical service.

The veterinary section is the foremost veterinary unit in the evacuation of animals. At the veterinary aid station the veterinary section:

- Receives and records animal casualties.

- Examines, sorts, and administers emergency treatment to disabled animals.

- Returns to the proper organization animals able to do further duty.

- Prepares sick and wounded animals for further evacuation.

- Destroys injured animals which cannot be salvaged.

Animals to be evacuated are collected by personnel from the veterinary units further to the rear, who make and maintain contact with veterinary aid stations.

Principles governing the establishment and operation of the veterinary aid station:

- Veterinary aid stations are established in combat when required to relieve units of sick and wounded animals.

Aid stations maintain contact with the combat unit they serve. The aid station is the proper place to give emergency treatment; it is not the proper place to undertake definitive treatment of any kind. Each animal evacuated should be equipped with a halter and halter-shank, and, if needed, a blanket. Usually but one veterinary aid station is established per regiment. In case a regiment is operating with widely separated battalions or squadrons, the sections and equipment are divided and two aid stations established.

Tag No.	12	CLASSIFICATION	BAABA9
PRIORITY GRADE			
NUMBER	B 490		
ORGANIZATION	Troop A 7th Cav.		
Division	1st Cav.	Coops	Third
STATION UNDER TAGGED	Regt. Vet Aid Station 7th Cav.		
DATE	May 15 1941	TIME	5.00 P.M.
DATE MALLIN TEST	Nov. 1, 1940	"N"	yes
ANTITETANIC SERUM	YES	1500	MAY 15 1940
ORIGINATED IN SERVICE	DATE		
DISPOSITION	Wd. Pen. Sev. L - Sole RH mid 3d C - Street Nail D - May 15, 1941. P - Near Cox's Well, N.M.		
COMPLICATIONS			
W. S. Allen SIGNATURE, WITH NAME AND ORGANIZATION Capt. V.C., 7th Cav. FORM 115b MEDICAL DEPARTMENT, U. S. A. (Revised October 20, 1940)			

Tag No.	12	CLASSIFICATION	BAABA9
PRIORITY GRADE			
NUMBER	B 490		
ORGANIZATION	Troop A 7th Cav.		
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SUPPLEMENTAL RECORD	
Evacuated to ORO Grande N.M.	
Date	May 16, 1941.
Evacuated to	Vet Co (Sep)
Date	May 16, 1941
Evacuated to	Vet Evac Hosp
Date	May 16 1941
Evacuated to	
Date	
FINAL DISPOSITION:	DUTY
No.	20494
TOTAL DAYS TREATMENT: 10	
Date	May 25, 1941
J. Gallanigan Major P.C.	

1st Vet Troop	
Evacuated to ORO Grande N.M.	
Date	May 16, 1941.
Evacuated to	Vet Co (Sep)
Date	May 16, 1941
Evacuated to	Vet Evac Hosp
Date	May 16 1941
Evacuated to	
Date	
FINAL DISPOSITION:	DUTY
No.	20494
TOTAL DAYS TREATMENT: 10	
Date	May 25, 1941
J. Gallanigan Major P.C.	

DISPOSITION AND OTHER NOTES	
Evac to Vet Tr	
May 16, 1941.	

Plate 31. The Emergency Veterinary Tag, Form 115b, M. D.

Front (top row) and back (bottom row) of original, duplicate and triplicate copies, respectively. When the emergency veterinary tag is used in combat, those sections of the tag which would reveal the identity of the organization to which the animal belongs, the location of the organization and such other information of value to the enemy will not be filled in. This would apply when the tag is initiated at such veterinary installations as aid stations, and clearing stations which may come in contact with the enemy.

The location of the veterinary aid station. The most suitable site for the veterinary aid station is at or near the point where the majority of the animals of the unit are assembled. When combat is imminent the unit veterinarian reconnoiters the regimental zone of action for suitable sites for the veterinary aid station, keeping in mind the following desirable features:

Shelter from enemy fire and observation.

Location in the vicinity of the greatest concentration of animals.

Proximity to water.

Routes for evacuation by the veterinary personnel from rear veterinary units (veterinary troops of the medical squadron or the veterinary company, separate) without interference with other transportation.

Protection from the elements.

As a result of the reconnaissance the unit veterinarian recommends to the unit surgeon one or more suitable locations for the veterinary aid station; the surgeon submits this to the unit S-4 for coordination. This is done informally. The aid station is established at the approved location as soon as the regiment is in position. Only such part of the aid station is established for which the need can be foreseen.

Functioning of the veterinary aid station. Personnel not designated as veterinary aid men work at or from the veterinary aid station. The unit veterinarian directs the work at the aid station, keeping in touch with the animal casualty situation. The junior officer directs the collection of casualties, and sends forward men at opportune times to bring back animal casualties to the veterinary aid station. The noncommissioned officer remains at the aid station at all times; he receives, sorts, and records casualties and prepares the emergency veterinary tags. In the detachments with field artillery and cavalry, veterinary aid men may be attached to battalions or squadrons during combat. In mounted cavalry action it may be advantageous to attach one to each troop. These veterinary aid men follow their units into battle, give emergency treatment, tag sick and wounded animals, and place them in sheltered positions where they can be located by the veterinary aid station personnel.

Classification of Sick and Wounded Animals. Proper classification is a most important feature of evacuation. Its object is to eliminate the nonsalvageable and to prevent salvageable animals from going farther to the rear than is necessary to secure definite treatment. Disabled animals are classified as follows:

Salvageable. Those animals amenable to treatment within a reasonable time as follows:

Minor cases which can be returned for duty immediately after treatment.

Moderate cases which promise recovery within three to five days without hampering the mobility of the command.

Severe cases able to walk or undergo transportation, including cases of communicable disease, which might menace the health of other animals. This is the class of animals prepared for evacuation.

Nonsalvageable. Those animals requiring immediate destruction on account of:

Incurable sickness or injury.

Inability to walk, no transportation being obtainable.

Communicable disease of such a nature that treatment is impracticable.

Cavalry

The Medical Detachment with Cavalry. For tactical employment in the field the medical detachment supporting a regiment of cavalry is divided into a headquarters section, 3 squadron medical sections, and a regimental veterinary section.

In garrison or on the march. With troops in garrison, on the march, or in permanent or semi-permanent camps the service rendered by the regimental medical detachment attached to regiments of cavalry is in principle the same as in the case of regimental medical detachments attached to regiments of infantry.

The Headquarters Section of the Regimental Medical Detachment. In combat the headquarters section of the regimental medical detachment usually accompanies the regimental reserve, from which position the regimental surgeon will supervise, reinforce, and to a limited degree supply the squadron medical sections serving the squadrons of the regiment. The medical truck remains with the regimental train until such time as it is ordered forward for the purpose of establishing a regimental aid station. The regimental surgeon should maintain close contact with the regimental commander and with each squadron medical section of the detachment.

The Squadron Medical Section. Squadron medical sections follow closely the squadrons to which attached. The squadron surgeon maintains close contact with each troop of the squadron. When the squadron deploys for action, the squadron medical section,

and such personnel as may be attached, take up a position with or near the squadron reserve.

Squadron aid station. With cavalry organizations in combat, aid stations cannot often be established with any degree of assurance that they will long continue to function for the relief of the units which they are designed to serve. In certain special situations aid stations may be definitely established, but in many other situations fully established aid stations do not function properly and tend only to decrease the mobility of the medical unit and to increase the difficulty in maintenance of contact with the troops. The decision as to whether aid stations should or should not be established to cover any given situation must rest with the regimental and squadron surgeons, who are influenced in making such decisions by the relative dispersion of troops, their principal mission, the character of the action anticipated, and the character of the terrain over which the troops will operate.

Aid stations should never be fully established during periods of continued and rapid movement of troops, nor when the dispersion of troops is such that any given aid station will not serve more than one troop, situations which are not unusual in the service of the cavalry.

When cavalry is employed as a covering force, acting as a screen for the advance of troops, conducting distant reconnaissance, or employed in connecting separate armies or parts of armies in their advance, no attempts should be made to establish aid stations except at halts for the night and at such other times as minor contacts with the enemy may produce a grouping of casualties and a temporary cessation of movement.

During combat, when the cavalry regiment or squadron thereof is operating on the enemy's flank, exploiting a break in the enemy's line, filling gaps in the line, or participating in the main battle, aid stations should be established partially or fully. When cavalry is employed as a covering force they may be established partially, but a high degree of mobility should be maintained.

Troop aid group. When the squadron medical section is able to utilize troop aid men, they function with each troop of cavalry in the same manner as do company and battery aid men attached to companies of infantry and batteries of field artillery. Two men are usually attached to each troop. Casualties occurring in the troop are first attended by troop aid men, by whom they are examined, dressed, and directed to the position of the aid station group of the squadron medical section.

Litter bearers may be designated in situations when cavalry may be dismounted temporarily and fight on foot.

Casualties unable to walk are removed to the position of the aid station group by the use of their own mounts, the travois, the field ambulance of the regimental medical detachment, or by requisitioned, wheeled transportation. Casualties unable to endure transportation are left with medical material and with or without medical attendants in the care of civilian inhabitants.

Medical Service in Dismounted Action. In many situations, such as delaying actions, the holding of strategic points, or when cavalry units go to the assistance of hard-pressed infantry, cavalry may be dismounted temporarily to fight on foot. This is known as dismounted action of cavalry, and throughout its duration the medical service of the organization is conducted in the same general manner as for like organizations of infantry. Troop aid men should accompany their troops into action. Squadron medical sections may or may not establish aid stations, depending upon the type, probable extent, and probable duration of the action. If aid stations are not established, *collecting points* for the sick and wounded are designated along the axis of movement of each troop or upon the previously designated line of withdrawal of such units.

Medical Service in a Detached Troop. When a single troop of cavalry is detached from its parent organization the troop aid men remain with it for the purpose of conducting the medical service of the troop. If the troop is to be detached for more than a few days, and is accompanied by a medical officer, a medical and surgical chest or box of medicines and dressings will be carried on one of the trucks accompanying the troop.

Veterinary Sections with Cavalry. The same principles of organization and operation are applicable for the veterinary sections of cavalry as are used for those of horse-

drawn artillery. Their equipment is carried on two packhorses, and they can establish one regimental veterinary aid station or two squadron veterinary aid stations. One aid station is usually set up in the rear of the pivot of maneuver, while the other squadron veterinary section follows the maneuvering force in readiness to set up the station when the situation indicates. More often, the detailed squadron is accompanied by one officer, one sergeant, and three privates who are kept available for that purpose. A detached troop may be accompanied by a private first class from the veterinary section. Usually, the unit personnel is kept together near the squadrons supported and assigned as the situations arise which require their services. They may be located with the combat trains when these trains are in close proximity to their units.

ARMORED UNITS

Attached Medical Personnel with the Armored Division. *General.* The big difference between employment of the Armored Division and the Infantry Division lies in their differences in speed and radius of action. The Armored Division consists fundamentally of five elements: Command, Reconnaissance, Striking, Supporting, and Service. The *Command* element of the division consists of the division commander and his staff; in action they may move swiftly in tanks or other vehicles. The *Reconnaissance* element consists of reconnaissance vehicles and light tanks which seek information or serve as a delaying force pending the arrival of the striking force of the division. The *Striking* element includes the armored regiments which are the main attack force of the armored division. It also includes Armored Field Artillery equipped with 105-mm howitzers on highly mobile self-propelled mounts. Due to its high degree of mobility the artillery can be placed in action quickly and as quickly displace to new positions thus rendering close fire support for the tank regiments. The *support element* is the Armored Infantry Regiment which is so organized that a battalion may be attached to each tank regiment for the purpose of forming *combat commands* (combat teams). The infantry is transported prior to contact with the enemy on half-track personnel carriers, however, they routinely dismount and fight on foot, the half-track carriers being concealed in a nearby defiladed area. When once committed, tanks do not halt until they reach the *rallying point* where control is regained, new objectives and new rallying points are designated and tanks may be rearmed and regassed. Medical support must be provided for all units of the division. The attached medical personnel is a part of each element and must render emergency treatment and provide for early collection of the casualties. To understand this medical support it is necessary that the reader be familiar with T/O 17, "The Armored Division" and the tactics of armored units.

The medical service of the attached personnel of the Armored Division must be adapted to the field and combat conditions and requirements of the element it is supporting. First echelon medical service consists largely of emergency treatment, the collection of casualties along the main axis of advance, and the initiation of medical records. First aid training of the combat personnel of the armored units must attain a high degree of perfection since often casualties will be incurred.

Since mobility and high fire power characterize mechanized action both during combat and for security, combat is ordinarily of short duration and is followed by rapid movement. The routine employment of the Armored Division carries it deep into enemy territory and often units of the division are completely surrounded by hostile troops. Attached medical personnel (medical detachments) therefore must render emergency treatment and initiate evacuation under trying conditions, surrounded by enemy. Casualties must be carried within the vehicles, in many instances, and treated as soon as they can be removed, at rallying points after objectives are taken. Aid stations are rarely established but are kept mobile in order to advance rapidly to successive rallying points. Responsibility for evacuation by medical detachments with armored units lies both *from the front and to the rear*, hence the provision of lightly armored half-track cars with litter inserts.

The organization of the various medical detachments is given in Plates 32 through 38, note the small number of or absence of litter bearers. The litter bearers provided the

medical detachments attached to tank regiments will be employed chiefly to remove casualties from tanks at rallying points and for short litter carry within the rallying point area to the mobile aid station for treatment and evacuation.

The Armored Infantry Regiment. Detachments with the Armored Infantry Regiment operate quite similar to medical detachments with the foot infantry. The Armored

1	2	3	4	5	6	7
Unit	Technician grade	Head-quarters section	3 bat-talion sections (each)	Total detachment	En-listed cadre	Remarks
Major.....		(d) 1		1		* With inserts for litters; for use as front line ambulances. † Dental.
Captain.....		2	1	3		
First lieutenant.....						
Total commissioned.....		(d) 1	3	2	9	
Technical sergeant (673).....		1		1	1	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in A.R. 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
Staff sergeant (673).....		2	1	3	3	
Sergeant, including.....			(1)	(3)	(3)	
Medical (673).....		(1)	(1)	(1)	(1)	
Motor (337).....		(1)	(1)	(1)	(1)	
Supply (821).....		1	1	4	4	
Corporal (673).....				2	1	
Technician grade 4.....				15	1	
Technician grade 5.....		11	16	21		
Private, first class.....				21		
Private.....						
Chauffeur (345).....		(2)	(1)	(5)		
Clerk, general (405).....	5	(1)		(1)		
Driver, half-track (735).....	5	(2)	(2)	(5)		
Litter bearer (657).....		(1)	(3)	(4)		
Technician, dental (067).....	5	(1)	(1)	(2)		
Technician, medical (123).....			(1)	(1)	(1)	
Technician, medical (123).....			(1)	(3)		
Technician, sanitary (196).....		4	(2)	(2)	(1)	
Technician, surgical (225).....	5	(1)	(1)	(4)		
Technician, surgical (225).....			(3)	(9)		
Total enlisted.....		15	19	72	15	
Aggregate.....		18	21	81	15	
O Car, half-track, M3, without armament.....		2	2	8		
Q Truck, ¼-ton.....		1	1	4		
Q Truck, 2½-ton, cargo.....		1		1		

Plate 32. T/O 7-21, March 1, 1942. Medical Detachment, Armored Infantry Regiment, Armored Division.

1	2	3	4	5	6	7
Unit	Technician grade	Head-quarters section	3 bat-talion sections (each)	Total detachment	En-listed cadre	Remarks
Major.....		(d) 1		1		* With inserts for litters; for use as front line ambulances. † Dental.
Captain.....		2	1	(d) 1	2	
First lieutenant.....						
Total commissioned.....		(d) 1	5	1	(d) 1	8
Technical sergeant (673).....		1		1	1	
Staff sergeant (673).....		2	1	4	4	
Sergeant, including.....			(1)	(1)	(1)	
Motor (337).....		(1)	(1)	(1)	(1)	
Supply (821).....		(1)	(1)	(1)	(1)	
Corporal (673).....			1	3	3	
Technician, grade 4.....				2	1	
Technician, grade 5.....		14	12	15		
Private, first class.....				15		
Private.....				15		
Chauffeur (345).....		(3)	(1)	(6)		
Clerk, general (405).....	5	(1)		(1)		
Driver, half-track (735).....	5	(1)	(3)	(10)		
Litter bearer (657).....		(1)	(4)	(12)		
Mechanic automobile (014).....	5	(1)		(1)		
Technician, dental (067).....	5	(1)	(1)	(1)		
Technician, medical (123).....	5	(1)	(1)	(1)	(1)	
Technician, medical (123).....			(1)	(3)		
Technician, sanitary (196).....			(1)	(1)		
Technician, surgical (225).....	4	(2)	(1)	(2)	(1)	
Technician, surgical (225).....	5	(1)	(1)	(4)		
Technician, surgical (225).....		(2)	(2)	(8)		
Total enlisted.....		18	14	50	12	
Aggregate.....		23	15	68	12	
O Car, half-track M3, without armament.....		1	2	10		
Q Truck, ¼-ton.....		2	1	6		
Q Truck, 2½-ton, cargo.....		1		1		

Plate 33. T/O 17-11, March 1, 1942. Organization of the Medical Detachment Armored Regiment, Armored Division.

Infantry Regiment uses its armored half-track personnel carriers to transport the troops to the scene of battle and thereafter fights largely on foot. Consequently, they have need for company aid men, litter bearers and an aid station group. (See T/O 7-21).

	1	2	3	4	5
	Unit	Technician grade	Medical detachment	Enlisted cadre	Remarks
1					
2	Captain.....		1		
3	First lieutenant.....		(41) 3		
4	Total commissioned.....		4		• With inserts for litters; for use as front line ambulances.
5	Staff sergeant (673).....		1	1	^a Dental.
6	Sergeant (673).....		1	1	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
7	Corporal (673).....		1	1	
8	Technician, grade 4.....		2	1	
9	Technician, grade 5.....		8	1	
10	Private, first class.....		6		
11	Private.....		6		
12	Chauffeur (345).....		(3)		
13	Clerk, general (406).....		(1)		
14	Driver, half-track (735).....	5	(3)		
15	Litter bearer (657).....		(2)		
16	Technician, dental (067).....	5	(1)		
17	Technician, medical (123).....	5	(1)	(1)	
18	Technician, surgical (225).....	4	(2)	(1)	
19	Technician, surgical (225).....	5	(3)		
20	Technician, surgical (225).....		(6)		
21	Total enlisted.....		25	5	
22	Aggregate.....		29	5	
23	O Car, half-track M3, without armament.....		3		
24	Q Truck, 3/4-ton.....		3		
25	Q Truck 2 1/2-ton, cargo.....		1		

Plate 34. T/O 17-35, March 1, 1942. Medical Detachment, Armored Reconnaissance Battalion, Armored Division.

	1	2	3	4	5
	Unit	Technician grade	Medical detachment	Enlisted cadre	Remarks
1					
2	Captain.....		1		
3	First lieutenant.....		(41) 2		
4	Total commissioned.....		3		• With inserts for litters: for use as frontline ambulances.
5	Staff sergeant (673).....		1	1	^a Dental.
6	Sergeant (673).....		1	1	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
7	Corporal (673).....		1	1	
8	Technician grade 4.....		2	1	
9	Technician grade 5.....		6	1	
10	Private, first class.....		6		
11	Private.....		7		
12	Chauffeur (345).....		(2)		
13	Clerk, general (406).....		(1)		
14	Driver, half-track (735).....	5	(2)		
15	Litter bearer (657).....		(4)		
16	Technician, dental (067).....	5	(1)		
17	Technician, medical (123).....	5	(1)	(1)	
18	Technician, surgical (225).....	4	(2)	(1)	
19	Technician, surgical (225).....	5	(2)		
20	Technician, surgical (225).....		(6)		
21	Total enlisted.....		24	5	
22	Aggregate.....		27	5	
23	O Car, half-track, M3, without armament.....		2		
24	Q Truck, 3/4-ton.....		1		
25	Q Truck 2 1/2-ton, cargo.....		1		

Plate 35. T/O 6-165, March 1, 1942. Medical Detachment, Armored Field Artillery Battalion, Armored Division.

The *Armored Regiments and Reconnaissance Battalion*. Detachments with Armored Regiments are more specialized than others in that their tactical maneuvers are conducted entirely by means of the vehicles. Therefore the collection of casualties is limited to the fleeting periods of arrested movement at successive rallying points or after the engagement. Occasionally casualties may be removed from disabled vehicles which are thus prevented from keeping up with combat action.

Rallying point contact with the highly mobile tank battalions is the keynote of medical support for these units. Prompt removal of casualties from within tanks at rallying points must be accomplished by medical personnel in order to prevent suffering and to free individual tanks of the burden of casualties.

Detachments of supporting and service elements. See Plates 35 through 38. The detachments with the Armored Field Artillery Battalion T/O 6-165, the Maintenance Battalion T/O 9-65, the Supply Battalion T/O 10-35 and the Armored Engineer Battalion T/O 5-215 operate similarly to the medical detachments of like units of other types of divisions with the exception that their speed of movement is much greater.

	1	2	3	4	5
	Unit	Technician grade	Medical detachment	Enlisted cadre	Remarks
2	Captain.....		1		
3	First lieutenant.....		(4)2		
4	Total commissioned.....		3		
5	Staff sergeant (673).....		1	1	
6	Sergeant (673).....		1	1	
7	Corporal (673).....		1	1	
8	Technician, grade 4.....		1	1	
9	Technician, grade 3.....		3	1	
10	Private, first class.....		5		
11	Private.....		4		
12	Chauffeur (345).....		(1)		
13	Clerk, general (405).....		(1)		
14	Technician, dental (667).....	5	(1)		
15	Technician, medical (123).....	5	(1)	(1)	
16	Technician, medical (223).....		(1)		
17	Technician, surgical (225).....	4	(1)		
18	Technician, surgical (225).....	5	(1)		
19	Technician, surgical (225).....		(3)		
20	Total enlisted.....		16	5	
21	Aggregate.....		19	5	
22	Q Ambulance, cross country.....		1		
23	Q Truck, 3½-ton, command.....		1		
24	Q Truck, 2½-ton, cargo.....		1		

^aDental.
The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.

Plate 36. T/O 9-65, March 1, 1942. Medical Detachment, Maintenance Battalion Armored Division.

Casualty estimates and types of casualties. Casualty estimates for tank regiments rarely exceed 5%. Of these, 4% are dead, leaving only 1% requiring medical care. In the armored infantry regiments the casualty rates are only slightly higher. The British Armored Forces in Libya have sustained approximately 10% casualties for all divisions employed. However, certain elements have sustained a much higher casualty rate per battle day. The types of casualties vary somewhat among the different elements of the armored division. In tank regiments fractures of the lower extremities due to the blasting effects of antitank-mines, minor wounds from metal splintering inside the tanks, fatal wounds from penetrating projectiles, and burns are the most common. Therefore, not many walking wounded from tank regiments will come to the battalion medical sections for treatment. In the armored infantry regiments all the wounds of modern warfare will be present. It is therefore imperative that first aid training of armored combat personnel be of high quality. This is especially true with reconnaissance elements since this element moves far from immediate medical facilities and casualties must be carried within the vehicles.

Medical equipment. Medical equipment necessarily must be the simplest with which emergency treatment can be administered and consists (in addition to the first-aid vehicular kits) of items essential for the control of hemorrhage, treatment of shock, and the splinting of fractures. Lifting apparatus used to remove the casualties through the turrets of the tanks consists of improvised slings. Current publications of the Military Intelligence Service of the War Department give full details of this specialized procedure.

Collecting points. Collecting points are areas where casualties may be removed from tanks, either while they are in action or at a rallying point. Tanks will not stop once they enter combat unless an area offers definite concealment, cover, and defilade. Some

tanks have a safety hatch designed particularly for the purpose of removing casualties readily. A collecting point will often serve as an aid station site.

Battalion aid stations. Aid stations are not set up by battalion medical sections in rear of the battalions when they are committed to action because the rapid movement of the armored battalions renders it impractical, especially in fire-swept zones. The

	1	2	3	4	5
1	Unit	Technician grade	Total	Enlisted cadre	Remarks
2	Captain.....		1		
3	First lieutenant.....		(4) 2		
4	Total commissioned.....		3		d Dental.
5	Staff sergeant (673).....		1	1	
6	Sergeant (673).....		1	1	
7	Corporal (673).....		1	1	
8	Technician, grade 4.....		1	1	
9	Technician, grade 5.....		3	1	
10	Private, first class.....		6		
11	Private.....		4		
12	Chauffeur (345).....		(4)		
13	Clerk, general (405).....		(1)		
14	Technician, dental (687).....		(1)		
15	Technician, medical (123).....	5	(1)	(1)	
16	Technician, medical (123).....		(1)		
17	Technician, surgical (225).....	4	(1)	(1)	
18	Technician, surgical (225).....	6	(1)		
19	Technician, surgical (225).....		(3)		
20	Total enlisted.....		16	5	
21	Aggregate.....		19	5	
22	Q Ambulance, cross-country.....		1		
23	Q Truck, ½-ton, command.....		1		
24	Q Truck, 2½-ton, cargo.....		1		

Plate 37. T/O 10-35, March 1, 1942. Medical Detachment, Supply Battalion, Armored Division.

	1	2	3	4	5
1	Unit	Technician grade	Medical detachment	Enlisted cadre	Remarks
2	Captain.....		1		
3	First lieutenant.....		(4) 2		
4	Total commissioned.....		3		* With inserts for litterers; for use as front line ambulances.
5	Staff sergeant (673).....		1	1	d Dental.
6	Sergeant (673).....		2	2	The serial number
7	Corporal (673).....		2	2	symbol shown in parentheses is an inseparable
8	Technician, grade 4.....		2	1	part of the specialist designation. A number below
9	Technician, grade 5.....		6		500 refers to an occupational specialist whose
10	Private, first class.....		7		qualification analysis is found in AR 615-28. A
11	Private.....		7		number above 500 refers to a military occupational
12	Chauffeur (345).....		(7)		specialist listed in Circulars Nos. 14 and 67,
13	Clerk, general (405).....		(1)		War Department, 1942.
14	Driver, half-track (735).....		(2)		
15	Technician, dental (687).....	5	(1)		
16	Technician, medical (123).....	5	(1)	(1)	
17	Technician, surgical (225).....	4	(2)	(1)	
18	Technician, surgical (225).....	5	(2)		
19	Technician, surgical (225).....		(6)		
20	Total enlisted.....		27	7	
21	Aggregate.....		30	7	
22	O Car, half-track, M3, without armament.....		2		
23	Q Ambulance, cross-country.....		1		
24	Q Truck, ½-ton.....		1		
25	Q Truck, 2½-ton, cargo.....		1		

Plate 38. T/O 5-215, March 1, 1942. Medical Detachment, Armored Engineer Battalion, Armored Division.

battalion medical sections move along the axis of advance with the forward echelon train vehicles which carry supplies needed immediately and constantly in battle, *i.e.* ammunition, gasoline and oil. The medical detachments and forward echelon train vehicles proceed as far forward as the situation will permit and there halt awaiting information that the battalions have succeeded in taking their objectives and have gone into rallying areas. Thereupon the supply vehicles and medical detachments hasten to join the armored battalions at the rallying points to render service. Here the aid station personnel first remove casualties from the tanks thus freeing these vehicles for

further combat action. Time is then available while the tanks continue the fight for collection and emergency treatment of casualties and to initiate as soon as practicable their evacuation by means of the half-track cars organically belonging to the medical detachments.

Treatment consists normally of arresting hemorrhage, applying sterile dressings, chemotherapy when required, emergency splinting, administration of sedatives and morphine (in syrettes ready for injection), treatment of shock, and partially completing and attaching emergency medical tags.

Regimental aid stations. In the armored regiments the regimental aid station may be a link in the evacuation from the armored battalions and is therefore in definite contrast to evacuation within the infantry regiment of the infantry division. Regimental aid stations are located near the regimental CP so as to assure convenient liaison between the regimental surgeon and the regimental commander. Defilade, cover, concealment and camouflage must be sought. The site should be on the axis of advance and near roads to intercept the drift of wounded. The terrain should be unsuited for tank operations and located where trees will afford protection for casualties. Cross roads, permanent land marks and similar targets should be avoided. The regimental aid station has armored half-track personnel carriers to evacuate wounded men from collecting points and battalion medical sections. Under difficult conditions, such as heavy enemy fire, half-track armored personnel carriers will evacuate casualties to the rear from the regimental and battalion aid stations toward the division medical installation.

Medical personnel accompanying maintenance crews offer only a limited solution to the difficult problem of medical support of armored elements. Maintenance crews, especially heavy maintenance, are sufficiently far behind the scene of action that considerable delay in rendering medical aid would be entailed. Difficulties are presented when tanks are overturned or the various hatches jammed by enemy missiles. In such cases the crew can not abandon the tank. The maintenance crews will have to provide a means of exit, such as burning a hole through the armor by means of an acetylene torch. For this reason some medical personnel will often accompany the maintenance crews in order to administer emergency treatment at the earliest possible moment.

Attached Medical Personnel with Other Units. Medical detachments with the Mountain, Quartermaster, Engineer, Ordnance, Special Troops, Air Force, Chemical, Signal, Coast Artillery, and other units have the same basic principles of interior organization, operation, training, and tactical management in garrison, on the march, in camp, and in combat as stated for infantry and artillery detachments. See current Tables of Organization for personnel strength of officers and enlisted men and transportation.

Tables of Organization for several such units are as shown below.

	1	2	3	4
	unit	Technician grade	Total detachment	Remarks
1	Captain.....		1	
2	First Lieutenant.....		d1	
3	Total commissioned.....		2	
4	Sergeant (673).....		1	
5	Technician, grade a )	(	1	
6	Technician, grade s )	(	2	
7	Private, first class )	(	1	
8	Private.....	(	1	
9	Chauffeur (305).....		(1)	
10	Technician, dental (067).....	5	(1)	
11	Technician, medical (123).....	5	(1)	
12	Technician, surgical (225).....	4	(1)	
13	Basic (521).....		(1)	
14	Total enlisted.....		6	
15	Aggregate.....		8	
16	Q Truck, 2½-ton, cargo.....		1	

^dDental.
The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 24, War Department, 1942.

Plate 39. T/O 10-15, April 1, 1942. Organization of the Medical Detachment, Quartermaster Battalion, Infantry Division.

The personnel strength of other Quartermaster units for which special medical detachment tables are not shown are as follows:

T/O 10-65, April 1, 1942. Quartermaster Service Battalion; 3 officers and 10 enlisted men.

T/O 10-95, April 1, 1942. Quartermaster Remount Squadron, 7 officers and 32 enlisted men.

T/O 10-115, April 1, 1942. Quartermaster Squadron, Cavalry Division (Horse); 3 officers and 14 enlisted men.

T/O 10-145, April 1, 1942. Quartermaster Bakery Battalion; 2 officers and 9 enlisted men.

T/O 10-297, January 21, 1942. Quartermaster Graves Registration Company; 13 enlisted men (obtains information for identification of dead).

	1	2	3	4	5
	Unit	Technician grade	Total	En-listed cadre	Remarks
1					
2	Captain.....		1		
3	First lieutenant.....		(4) 3		4 Dental.
4	Total commissioned.....		4		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
5	Staff sergeant (673).....		1	1	
6	Sergeant (673).....		2	2	
7	Corporal (673).....		1		
8	Technician, grade 4.....		2		
9	Technician, grade 5 including.....		4		
10	Private, first class.....		4		
11	Private.....		6		
12	Chauffeur (345).....		(4)		
13	Dental technician (067).....	5	(1)		
14	Dental technician (067).....		(2)		
15	Medical technician (123).....	5	(2)		
16	Medical technician (123).....		(2)		
17	Surgical technician (225).....	4	(2)		
18	Surgical technician (225).....	5	(1)		
19	Basic (521).....		(2)		
20	Total enlisted.....		20	3	
21	Aggregate.....		24	3	
22	Q Trailer, 1-ton, 2-wheel, cargo.....		2		
23	Q Truck, 1/2-ton.....		2		
24	Q Truck, 3/4-ton, weapon carrier.....		1		
25	Q Truck, 2 1/4-ton, cargo.....		1		

Plate 40. T/O 10-165, April 1, 1942. Organization of the Medical Detachment, Quartermaster Laundry Battalion.

	1	2	3	4
	Unit	Technician grade	Total	Remarks
1				
2	Captain.....		1	
3	First lieutenant.....		(4) 1 2	4 Dental.
4	Total commissioned.....		3	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
5	Sergeant (673).....		1	
6	Corporal (673).....		1	
7	Technician, grade 4.....		1	
8	Technician, grade 5 including.....		3	
9	Private, first class.....		2	
10	Private.....		2	
11	Chauffeur (345).....		(2)	
12	Dental technician (067).....	5	(1)	
13	Dental technician (123).....	5	(1)	
14	Medical technician (123).....		(1)	
15	Medical technician (225).....	4	(1)	
16	Surgical technician (225).....	5	(1)	
17	Basic (521).....		(1)	
18	Total enlisted.....		10	
19	Aggregate.....		13	
20	Q Trailer, 1-ton, 2-wheel, cargo.....		1	
21	Q Truck, 1/2-ton.....		1	
22	Q Truck, 2 1/2-ton, cargo.....		1	

Plate 41. T/O 10-175, April 1, 1942. Organization of the Medical Detachment, Quartermaster Sterilization Battalion.

	1	2	3	4	5	6
	Unit	Technician grade	Head-quarters section	2 bat-talion sections (each)	Total detachment	Remarks
2	Major.....		1		1	
3	Captain.....		(d 1) 2	1	4	
4	First lieutenant.....		d 1		1	
5	Total commissioned.....		4	1	6	
6	Technical sergeant.....		1		1	
7	Staff sergeant.....			1	1	
8	Sergeant.....		1		1	
9	Corporal.....			1	2	
10	Technician, grade 5.....				4	
11	Private, first class.....		13	10	13	
12	Private.....				16	
13	Attendant, medical (521).....			(2)	(6)	
14	Chauffeur (345).....		(3)	(1)	(5)	
15	Clerk, record (405).....		(1)		(1)	
16	Technician, dental (067).....	5	(1)		(1)	
17	Technician, medical (123).....	5	(1)	(2)	(3)	
18	Technician, medical (123).....				(2)	
19	Technician, sanitary (196).....		(1)		(1)	
20	Technician, surgical (225).....	5	(1)	(1)	(1)	
21	Technician, surgical (225).....				(2)	
22	Basic (521).....		(3)		(3)	
23	Total enlisted.....		15	12	39	
24	Aggregate.....		19	13	45	
25	Q Ambulance, cross country.....		1		1	
26	Q Truck, ¾-ton, command and reconnaissance.....		1		1	
27	Q Truck, 2½-ton, cargo.....		1	1	2	

Plate 42. T/O 5-21, April 1, 1942. Organization of the Medical Detachment, Engineer General Service Regiment.

	1	2	3	4
	Unit	Technician grade	Total detachment	Remarks
2	Major.....		1	
3	Captain.....		(d 1) 2	
4	First lieutenant.....		1	
5	Total commissioned.....		4	
6	Technical sergeant.....		1	
7	Staff sergeant.....		1	
8	Corporal.....		1	
9	Technician, grade 4.....		1	
10	Technician, grade 5.....		2	
11	Private, first class.....		9	
12	Private.....		10	
13	Chauffeur (344).....		(2)	
14	Litter bearer (657).....		(10)	
15	Technician, dental (067).....	5	(1)	
16	Technician, medical (123).....	5	(1)	
17	Technician, medical (123).....		(3)	
18	Technician, surgical (225).....		4	
19	Technician, surgical (225).....		(2)	
20	Basic (521).....		(2)	
21	Total enlisted.....		25	
22	Aggregate.....		29	
23	Q Ambulance, cross country.....		1	
24	Q Truck, ¾-ton, command.....		1	
25	Q Truck, 2½-ton, cargo.....		1	

Plate 43. T/O 5-35, April 1, 1942. Organization of the Medical Detachment, Engineer Battalion, Separate.

1	2	3	4
Unit	Technician grade	Total	Remarks
2 Captain.....		1	^d Dental. The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
3 First lieutenant.....		(4) 2	
4 Total commissioned.....		3	
5 Sergeant.....		1	
6 Corporal.....		2	
7 Technician, grade 4.....		1	
8 Technician, grade 5.....		1	
9 Private, first class.....	including.....	3	
10 Private.....		3	
11 Company aid man (123).....		(5)	
12 Dental technician (967).....		(1)	
13 Medical technician (123).....		5 (1)	
14 Surgical technician (225).....		4 (1)	
15 Total enlisted.....		11	
16 Aggregate.....		14	
17 Q Ambulance, cross country.....		1	
18 Q Truck, 2½-ton, cargo.....		1	

Plate 44. T/O 5-55, April 1, 1942. Organization of the Medical Detachment, Engineer Topographic Battalion, Army.

1	2	3	4
Unit	Technician grade	Total	Remarks
2 Captain.....		1	^d Dental. The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
3 First lieutenant.....		(4) 2	
4 Total commissioned.....		3	
5 Staff sergeant.....		1	
6 Corporal.....		1	
7 Technician, grade 5.....		2	
8 Private, first class.....	including.....	4	
9 Private.....		4	
10 Chauffeur (345).....		(3)	
11 Company aid man (123).....		(4)	
12 Medical technician (123).....		5 (1)	
13 Medical technician (123).....		(1)	
14 Surgical technician (225).....		5 (1)	
15 Total enlisted.....		12	
16 Aggregate.....		15	
17 Q Ambulance, cross country.....		1	
18 Q Truck, ¾-ton, command and reconnaissance.....		1	
19 Q Truck, 2½-ton, cargo.....		1	

Plate 45. T/O 5-65, April 1, 1942. Organization of the Medical Detachment, Engineer Water Supply Battalion.

1	2	3	4
Unit	Technician grade	Total	Remarks
2 Captain.....		1	^d Dental. The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
3 First lieutenant.....		1	
4 Total commissioned.....		2	
5 Staff sergeant (673).....		1	
6 Corporal (673).....		1	
7 Technician, grade 5.....		2	
8 Private, first class.....	including.....	4	
9 Private.....		4	
10 Chauffeur (345).....		(3)	
11 Company aid man (122).....		(4)	
12 Technician, medical (123).....		5 (1)	
13 Technician, medical (123).....		(1)	
14 Technician, surgical (225).....		5 (1)	
15 Total enlisted.....		12	
16 Aggregate.....		14	
17 Q Ambulance, cross country.....		1	
18 Q Truck, ¾-ton, command and reconnaissance.....		1	
19 Q Truck, 2½-ton, cargo.....		1	

Plate 46. T/O 5-95, April 1, 1942. Organization of the Medical Detachment, Engineer Camouflage Battalion, Army.

	1	2	3	4
	Unit	Technician grade	Total detachment	Remarks
1				
2	Captain.....		1	^d Dental. The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
3	First lieutenant.....		4 1	
4	Total commissioned.....		2	
5	Staff sergeant (673).....		1	
6	Sergeant (673).....		1	
7	Technician, grade 5.....		1	
8	Private, first class.....		3	
9	Private.....		4	
10	Chauffeur (345).....		(3)	
11	Company aid man (123).....		(4)	
12	Technician, surgical (225).....	5	(1)	
13	Total enlisted.....		10	
14	Aggregate.....		12	
15	Q Ambulance, cross country.....		1	
16	Q Truck, $\frac{1}{2}$ -ton, command and reconnaissance.....		1	
17	Q Truck, $2\frac{1}{2}$ -ton, cargo.....		1	

Plate 47. T/O 5-115, April 1, 1942. Organization of the Medical Detachment, Engineer Squadron.

	1	2	3	5	5	6
	Unit	Technician grade	Headquarters section	2 battalion sections (each)	Total (headquarters section and 2 battalion sections)	Remarks
1						
2	Major.....		1		1	^d Dental. The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
3	Captain.....		4 1	1	3	
4	First lieutenant.....		(4 1) 2		2	
5	Total commissioned.....		4	1	6	
6	Technical sergeant (585).....		1		1	
7	Staff sergeant (652).....		1		2	
8	Sergeant (652).....		1		1	
9	Corporal (653).....			1	2	
10	Technician, grade 4.....				1	
11	Technician, grade 5.....				5	
12	Private, first class.....		9	13	13	
13	Private.....				16	
14	Chauffeur (344).....	5	(1)		(1)	
15	Chauffeur (344).....		(1)	(2)	(3)	
16	Clerk, general (655).....		(1)	(1)	(2)	
17	Company aid (123).....		(1)	(5)	(11)	
18	Technician, dental (667).....	5		(1)	(2)	
19	Technician, medical (123).....	5		(1)	(2)	
20	Technician, medical (123).....		(1)	(1)	(3)	
21	Technician, sanitary (196).....		(1)		(1)	
22	Technician, surgical (225).....	4		(1)	(1)	
23	Technician, surgical (225).....			(1)	(2)	
24	Basic (521).....		(2)	(1)	(4)	
25	Total enlisted.....		11	15	41	
26	Aggregate.....		15	16	47	
27	Q Ambulance, cross country.....				1	
28	Q Truck, $\frac{1}{2}$ -ton, command and reconnaissance.....		1		1	
29	Q Truck, $2\frac{1}{2}$ -ton, cargo.....		1	1	3	

Plate 48. T/O 5-171, April 1, 1942. Organization of the Medical Detachment, Engineer Combat Regiment.

	1	2	3	4
1	Unit	Technician grade	Total	Remarks
2	Captain.....		1	4 Dental. The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in A.R. 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
3	First lieutenant.....		(4 1) 2	
4	Total commissioned.....		3	
5	Sergeant.....		1	
6	Corporal.....		1	
7	Technician, grade 4.....		1	
8	Technician, grade 5.....		1	
9	Private, first class.....		3	
10	Private.....		4	
11	Company aid man (123).....		(5)	
12	Dental technician (067).....		(1)	
13	Medical technician (123).....		(1)	
14	Surgical technician (225).....	4	(1)	
15	Basic (521).....		(1)	
16	Total enlisted.....		11	
17	Aggregate.....		14	
18	Q Ambulance, cross-country.....		1	
19	Q Truck, ¾-ton, command and reconnaissance.....		1	
20	Q Truck, 2½-ton, cargo.....		1	

Plate 49. T/O 5-185, April 1, 1942. Organization of the Medical Detachment, Engineer Topographic Battalion, GHQ.

	1	2	3	4
1	Unit	Technician grade	Total detachment	Remarks
2	Captain.....		1	4 1 dental. 1 veterinary. The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in A.R. 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
3	First lieutenant.....		4 3	
4	Total commissioned.....		4	
5	Staff sergeant (573).....		1	
6	Corporal (573).....		1	
7	Technician, grade 5.....		3	
8	Private, first class.....		7	
9	Private.....		7	
10	Litter bearer (521).....		(3)	
11	Technician, dental (067).....		(1)	
12	Technician, medical (123).....	5	(1)	
13	Technician, medical (123).....		(1)	
14	Technician, surgical (225).....	5	(1)	
15	Technician, veterinary (226).....		(1)	
16	Truck driver, light (345).....		(3)	
17	Basic (521).....		(1)	
18	Total enlisted.....		19	
19	Aggregate.....		23	
20	Q Ambulance, ¾-ton.....		1	
21	Q Truck, ¾-ton, command and reconnaissance.....		1	
22	Q Truck, 2½-ton, cargo.....		1	

Plate 50. T/O 5-235, April 1, 1942. Organization of the Medical Detachment, Engineer Mountain Battalion.

	1	2	3	4
	Unit	Technician grade	Total	Remarks
1				
2	Captain.....		1	
3	First lieutenant.....		1	
4	Total commissioned.....		2	^d Dental. The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
5	Sergeant.....		1	
6	Technician, grade 5.....		1	
7	Private, first class.....		2	
8	Private.....		2	
9	Dental technician (067).....	5	(1)	
10	Medical technician (123).....		(2)	
11	Truck driver, light (345).....		(2)	
12	Total enlisted.....		6	
13	Aggregate.....		8	
14	Q Ambulance, cross-country.....		1	
15	Q Truck, 2½-ton, cargo.....		1	

Plate 51. T/O 5-275, April 1, 1942. Organization of the Medical Detachment, Engineer Heavy Ponton Battalion.

	1	2	3	4	5	6
	Unit	Technician grade	Headquarters section	3 battalion sections (each)	Total	Remarks
1						
2	Major.....		^a 1		1	
3	Captain or first lieutenant.....		^d 1	(4)3	10	^a Unit surgeon. . ^d Unit dental surgeon.
4	Total commissioned.....		2	3	11	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
5	Technical sergeant, including.....		1		1	
6	Clerk, general (552).....		(1)		(1)	
7	Staff sergeant, including.....			1	3	
8	Chief clerk (052).....			(1)	(3)	
9	Sergeant, including.....		1		1	
10	Clerk, general (056).....		(1)		(1)	
11	Corporal, including.....			1	3	
12	Assistant section leader (552).....			(1)	(3)	
13	Technician, grade 5.....			(1)	(12)	
14	Private, first class.....				15	
15	Private.....				19	
16	Chauffeur (345).....				(2)	
17	Clerk, general (055).....		(1)	(1)	(4)	
18	Technician, dental (067).....	5	(1)	(1)	(4)	
19	Technician, medical (123).....	5	(1)	(1)	(4)	
20	Technician, medical (123).....		(1)	(3)	(10)	
21	Technician, surgical (225).....	5	(1)	(1)	(4)	
22	Technician, surgical (225).....		(1)	(3)	(10)	
23	Basic (521).....		(2)	(1)	(5)	
24	Total enlisted.....		12	14	54	
25	Aggregate.....		14	17	65	
26	Q Ambulance, motor field, cross country.....		1	1	4	
27	Q Truck, ½-ton, command and reconnaissance.....		1	1	4	
28	Q Truck, 1½-ton, cargo.....		1	1	4	

Plate 52. T/O 5-411, April 1, 1942. Organization of the Medical Section, Engineer Regiment, Aviation.

1	2	3	4	5	6
Unit	Technician grade	Headquarters section	3 battalion sections (each)	Total detachment	Remarks
Major.....		1		1	
Captain.....		(4) 2	1	3	
First lieutenant.....		1		1	4 Dental.
Total commissioned.....		4	1	7	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in A.R.
Technical sergeant (673).....		1		1	615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
Staff sergeant (673).....			1	1	
Sergeant (673).....				1	
Corporal (673).....				3	
Technician grade 4.....				1	
Technician grade 3.....				1	
Private, first class.....		13	16	29	
Private.....				29	
Chauffeur (344).....	5	(1)		(1)	
Chauffeur (344).....		(3)	(2)	(9)	
Clerk, record (325).....	5	(1)		(1)	
Company aid (409).....			(8)	(24)	
Technician, dental (067).....	5	(2)		(2)	
Technician, medical (123).....	5	(1)	(2)	(5)	
Technician, medical (123).....		(1)		(1)	
Technician, sanitary (190).....		4		(1)	
Technician, surgical (225).....	5	(2)	(2)	(6)	
Technician, surgical (225).....		(1)		(2)	
Technician, surgical (225).....		(2)		(7)	
Basic (521).....					
Total enlisted.....		15	18	69	
Aggregate.....		19	19	76	
Q Truck, 3/4-ton, command.....			1	5	
Q Truck, 2 1/4-ton, cargo.....		2	1	5	

Plate 53. T/O 3-11, April 1, 1942. Organization of the Medical Detachment, Chemical Motorized Regiment.

1	2	3	4	5	6	7	8	9
Unit	Technician grade	Headquarters section	1st battalion (gun) section	2d battalion (automatic weapons) section	3d battalion (searchlight) section	Total (headquarters section and 1st, 2d, and 3d battalion sections)	Enlisted cadre	Remarks
Major.....		1				1		
Captain.....		(4) 2	1	1	1	5		* May be first lieutenant.
First lieutenant.....		1				1		4 Dental.
Total commissioned.....		4	1	1	1	7		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in A.R. 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 87, War Department, 1942.
Technical sergeant, including.....		1				1		
Medical (673).....		(1)				(1)		
Staff sergeant, including.....			1	1	1	3		
Section leader (673).....			(1)	(1)	(1)	(3)		
Corporal, including.....			1	1	1	3		
Section leader, assistant (673).....			(1)	(1)	(1)	(3)		
Technician, grade 4.....						1		
Technician, grade 3.....						2		
Private, first class.....		15	11	11	9	46		
Private.....						21		
Battery aid man (123).....		(1)	(5)	(5)	(3)	(14)		
Chauffeur (345).....	5	(1)				(1)		
Chauffeur (345).....		(4)				(4)		
Clerk (405).....		(1)				(1)		
Technician, dental (067).....	5	(2)				(2)		
Technician, medical (123).....	5	(1)			(1)	(2)		
Technician, medical (123).....		(1)	(2)	(2)	(1)	(6)		
Technician, sanitary (190).....		(1)				(1)		
Technician, surgical (225).....	4	(1)				(1)		
Technician, surgical (225).....	5	(1)			(1)	(2)		
Technician, surgical (225).....		(2)	(2)	(1)	(6)			
Technician, surgical (225).....		(2)	(2)	(2)	(6)			
Basic (521).....								
Total enlisted.....		14	13	13	11	51	6	
Aggregate.....		18	14	14	12	58	6	
Q Ambulance.....		3					3	
Q Trailer, 1-ton, cargo.....		1					1	
Q Truck, 3/4-ton.....		1					1	
Q Truck, 2 1/4-ton, cargo.....		1					1	

Plate 54. T/O 4-11, April 1, 1942. Organization of the Medical Detachment, Coast Artillery Regiment, Antiaircraft, Mobile.

1	2	3	4	5	6	7
Unit	Specialists' ratings (class)	Headquarters section	1 battalion section	Total (headquarters section and 3 battalion sections)	Enlisted cadre	Remarks
2 Major.....		1		1		
3 Captain.....	(d) 2	a 1	(d) 1	5		
4 First lieutenant.....	d 1					a May be first lieutenant.
5 Total commissioned.....		4	1	7		b May be allotted to battalion medical sections.
6 Technical sergeant (673).....		1		1		d Dental.
7 Staff sergeant, including.....			(1)	3	(1)	
8 Section leader (652).....			(1)	(3)		
9 Sergeant, including.....		1		1		Summary of specialists' ratings
10 Technician, surgical (225).....	(1)			(1)		
11 Corporal, including.....			1	3	1	
12 Section leader, assistant (652).....			(1)	(3)	(1)	
13 Private, first class.....			8	13		Class
14 Private.....		14	8	23	4	Number
15 Battery aid man (521).....			(4)	(12)		
16 Chauffeur (245).....	5th	(4)		(4)		4th..... 1
17 Chauffeur (245).....	6th	(1)	(1)			5th..... 18
18 Clerk (055).....	5th	(1)		(1)		6th..... 6
19 Motorcyclist (678).....	6th	(1)		(1)		Total..... 22
20 Motorcyclist (678).....	6th	(1)		(1)		
21 Technician, dental (067).....	5th	(2)		(2)	(1)	
22 Technician, medical (123).....	4th	(1)		(1)		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in section I, AR 615-26. A number above 500 refers to a military occupational specialist listed in section II, AR 615-26.
23 Technician, medical (123).....	5th		(1)	(3)	(1)	
24 Technician, sanitary (196).....	6th	(1)		(1)		
25 Technician, surgical (225).....	5th	(1)	(1)	(4)	(1)	
26 Basic (521).....		(1)	(1)	(4)		
27 Total enlisted.....		16	10	46	6	
28 Aggregate.....		20	11	53	6	
29 Q Ambulance, field.....		b 3		3		
30 Q Motorcycle, with side car.....		2		2		
31 Q Truck, 1/2-ton, command.....		1		1		
32 Q Truck, 1 1/2-ton, cargo.....		1	1	4		

Plate 55. T/O 4-31, November 1, 1940. Organization of the Medical Detachment, Coast Artillery Regiment, 155-mm Gun.

1	2	3	4	5	6	7
Unit	Technician grade	Headquarters section	3 battalion sections (each)	Total	Enlisted cadre	Remarks
2 Major.....		1		1		
3 Captain.....	(d) 2	a 1	(d) 1	5		
4 First lieutenant.....	d 1					a May be first lieutenant.
5 Total commissioned.....		4	1	7		d Dental.
6 Technical sergeant (673).....		1		1		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
7 Staff sergeant, including.....			(1)	3	1	
8 Section leader (673).....			(1)	(3)		
9 Corporal, including.....			1	3	1	
10 Section leader, assistant (673).....			(1)	(3)	(1)	
11 Technician, grade 3.....				1		
12 Technician, grade 4.....				5	2	
13 Private, first class.....		12	8	13		
14 Private.....				17	3	
15 Battery aid man (123).....			(4)	(12)		
16 Chauffeur (345).....	5		(1)	(1)		
17 Chauffeur (345).....		(4)	(1)	(5)		
18 Clerk (055).....		(1)		(1)		
19 Technician, dental (067).....	5	(2)		(2)	(1)	
20 Technician, medical (123).....	5	(1)		(1)		
21 Technician, medical (123).....		(1)	(1)	(3)	(1)	
22 Technician, sanitary (196).....		(1)		(1)	(1)	
23 Technician, surgical (225).....	4	(1)		(1)		
24 Technician, surgical (225).....	5	(1)		(1)		
25 Technician, surgical (225).....			(1)	(3)	(1)	
26 Basic (521).....		(1)	(1)	(4)		
27 Total enlisted.....		13	10	43	7	
28 Aggregate.....		17	11	50	7	
29 Q Ambulance.....		3		3		
30 Q Trailer, water tank, 250-gallon.....		1		1		
31 Q Truck, 1/2-ton.....		1		1		
32 Q Truck, 2 1/2-ton, cargo.....			1	3		

Plate 56. T/O 4-41, April 1, 1942. Organization of the Medical Detachment, Coast Artillery Regiment, Railway Artillery.

	1	2	3	4	5	6	7
	Unit	Technical grade	Headquarters section	3 battalion sections (each)	Total	Enlisted cadre	Remarks
2	Major.....		1		1		
3	Captain.....		(4) 2	* 1	(4) 5		* May be first lieutenant.
4	First lieutenant.....		d 1		d 1		May be allotted to battalion medical sections.
5	Total commissioned.....		4	1	7		d Dental.
6	Technical sergeant.....		1		1		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
7	Staff sergeant, including.....		1		3	1	
8	Section leader (673).....			(1)	(3)	(1)	
9	Corporal, including.....			1	3	1	
10	Section leader, assistant (673).....			(1)	(3)	(1)	
11	Technician, grade 4.....				1		
12	Technician, grade 5.....				4		
13	Private, first class.....		13	7	13	3	
14	Private.....				16		
15	Battery aid man (123).....			(4)	(12)		
16	Chauffeur (345).....		(3)		(5)		
17	Clerk (055).....		(1)		(1)		
18	Technician, dental (067).....	5	(2)		(2)	(1)	
19	Technician, medical (123).....	5	(1)		(1)		
20	Technician, medical (123).....		(1)	(1)	(3)	(1)	
21	Technician, sanitary (196).....		(1)		(1)	(1)	
22	Technician, surgical (225).....	4	(1)		(1)		
23	Technician, surgical (225).....	5	(1)		(1)		
24	Technician, surgical (225).....			(1)	(3)	(1)	
25	Basic (521).....		(1)	(1)	(4)		
26	Total enlisted.....		14	9	41	6	
27	Aggregate.....		18	10	48	6	
28	Q Ambulance.....		b 3		3		
29	Q Trailer, 1-ton, cargo.....		1		1		
30	Q Truck, 1/4-ton.....		1		1		
31	Q Truck, 2 1/4-ton, cargo.....		1		1		

Plate 57. T/O 4-51, April 1, 1942. Organization of the Medical Detachment, Coast Artillery Regiment, 155-mm Gun, Mobile.

	1	2	3	4	5	6	7
	Unit	Technician grade	Headquarters section	3 battalion sections (each)	Total	Enlisted cadre	Remarks
2	Major.....		1		1		
3	Captain.....		(4) 2	* 1	(4) 5		* May be first lieutenant.
4	First lieutenant.....		d 1		d 1		Dental.
5	Total commissioned.....		4	1	7		The ambulances required by the detachment will be assigned by the harbor defense commander from the allotment made for his harbor defense in Table of Basic Allowances for the Coast Artillery Corps.
6	Technical sergeant (673).....		1		1		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
7	Staff sergeant, including.....			1	3	1	
8	Section leader (673).....			(1)	(3)	(1)	
9	Corporal, including.....			1	3	1	
10	Section leader, assistant (673).....			(1)	(3)	(1)	
11	Technician, grade 4.....				1		
12	Technician, grade 5.....				4	2	
13	Private, first class.....				17	2	
14	Private.....				23		
15	Battery aid man (123).....		(1)	(6)	(19)		
16	Chauffeur (345).....		(3)		(3)		
17	Clerk (055).....		(1)		(1)		
18	Technician, dental (067).....	5	(2)		(2)	(1)	
19	Technician, medical (123).....	5	(1)		(1)		
20	Technician, medical (123).....		(1)	(1)	(4)	(1)	
21	Technician, sanitary (196).....		(1)		(1)	(1)	
22	Technician, surgical (225).....	4	(1)		(1)		
23	Technician, surgical (225).....	5	(1)		(1)	(1)	
24	Technician, surgical (225).....			(2)	(6)		
25	Basic (521).....						
26	Total enlisted.....		13	13	52	6	
27	Aggregate.....		17	14	59	6	

Plate 58. T/O 4-61, April 1, 1942. Organization of the Medical Detachment, Coast Artillery Regiment, Harbor Defense, Type A.

1	2	3	4	5	6	7
Unit	Technician grade	Headquarters section	2 battalion sections (each)	Total	Enlisted cadre	Remarks
2 Major.....		1		1		
3 Captain.....		(d 1) 2	* 1	(d 1) 4		
4 First lieutenant.....		d 1		d 1		* May be first lieutenant. d Dental.
5 Total commissioned.....		4	1	6		The ambulances required by the detachments will be assigned by the harbor defense commander from the allotment made to his harbor defense in Table of Basic Allowances for the Coast Artillery Corps.
6 Technical sergeant (673).....		1		1		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26.
7 Staff sergeant, including.....		1	1	2	1	A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
8 Section leader (673).....			(1)	(2)	(1)	
9 Corporal, including.....			1	2	1	
10 Section leader, assistant (673).....			(1)	(2)	(1)	
11 Technician, grade 4.....				1		
12 Technician, grade 5.....			10	11	4	
13 Private first class.....				15	3	
14 Private.....						
15 Battery aid man (123).....			(1)	(6)	(13)	
16 Chauffeur (345).....				(2)		
17 Clerk (055).....			(1)	(1)		
18 Technician, dental (067).....	5	(2)	(2)	(2)	(1)	
19 Technician, medical (123).....	5	(1)		(1)		
20 Technician, medical (123).....			(1)	(2)	(1)	
21 Technician, sanitary (196).....			(1)	(1)	(1)	
22 Technician, surgical (225).....	4	(1)		(1)		
23 Technician, surgical (225).....	5	(1)		(1)		
24 Technician, surgical (225).....			(2)	(4)	(1)	
25 Basic (521).....			(2)	(4)		
26 Total enlisted.....		11	13	37	6	
27 Aggregate.....		15	14	43	6	

Plate 59. T/O 4-71, April 1, 1942. Organization of the Medical Detachment, Coast Artillery Regiment, Harbor Defense, Type B.

1	2	3	4	5	6	7
Unit	Technician grade	Headquarters section	4 battalion sections (each)	Total	Enlisted cadre	Remarks
2 Major.....		1		1		
3 Captain.....		(d 1) 2	* 1	(d 1) 6		
4 First lieutenant.....		d 1		d 1		* May be first lieutenant. d Dental.
5 Total commissioned.....		4	1	8		The ambulances required by the detachment will be assigned by the harbor defense commander from the allotment made to his harbor defense in Table of Basic Allowances for the Coast Artillery Corps.
6 Technical sergeant (673).....		1		1		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26.
7 Staff sergeant, including.....		1	1	4	1	A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
8 Section leader (673).....			(1)	(4)	(1)	
9 Corporal, including.....			1	4	1	
10 Section leader, assistant (673).....			(1)	(4)	(1)	
11 Technician, grade 4.....				1		
12 Technician, grade 5.....			15	10	4	
13 Private, first class.....				22	4	
14 Private.....						
15 Battery aid man (123).....			(1)	(6)	(25)	
16 Chauffeur (345).....				(4)		
17 Clerk (055).....			(1)	(1)	(1)	
18 Technician, dental (067).....	5	(2)	(2)	(2)		
19 Technician, medical (123).....	5	(1)	(1)	(5)	(1)	
20 Technician, medical (123).....			(1)	(1)	(1)	
21 Technician, sanitary (196).....			(1)	(1)		
22 Technician, surgical (225).....	4	(1)		(1)		
23 Technician, surgical (225).....	5	(1)		(1)		
24 Technician, surgical (225).....			(2)	(8)	(1)	
25 Basic (521).....			(2)	(1)	(6)	
26 Total enlisted.....		16	12	64	6	
27 Aggregate.....		20	13	72	6	

Plate 60. T/O 4-81, April 1, 1942. Organization of the Medical Detachment, Coast Artillery Regiment, Harbor Defense, Type C.

1	2	3	4	5	6	7	8	9
Unit	Technician grade	Headquarters section	Battalion sections			Total	Enlisted cadre	Remarks
			1st battalion (gun) section	2d battalion (auto-matic weapons) section	3d battalion (search-light) section			
1 Major		1				1		
2 Captain		(d1) 2	• 1	• 1	• 1	5		• May be first lieutenant.
3 First lieutenant		4 1				1		^d Dental.
4 Total commissioned		4	1	1	1	7		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
5 Technical sergeant (673)		1				1		
6 Staff sergeant, including		1				1		
7 Section leader (673)			(1)	(1)	(3)	(1)		
8 Corporal, including			(1)	1	1	3		
9 Section leader, assistant (673)			(1)	(1)	(1)	(3)		
10 Technician, grade 4						1		
11 Technician, grade 5						6		
12 Private, first class, including		13	11	11	9	16	3	
13 Private						21		
14 Battery aid man (123)		(1)	(5)	(5)	(3)	(14)		
15 Chauffeur (345)		(5)				(5)		
16 Clerk (055)		(1)				(1)		
17 Technician, dental (067)		5	(2)	(2)	(1)	(2)		
18 Technician, medical (123)		(1)				(1)		
19 Technician, medical (123)		(2)	(2)	(1)	(5)	(1)		
20 Technician, sanitary (196)		(1)				(1)		
21 Technician, surgical (225)		4	(1)			(1)		
22 Technician, surgical (225)		5	(4)		(1)	(2)		
23 Technician, surgical (225)			(2)	(2)	(1)	(5)	(1)	
24 Basic (521)			(2)	(2)	(2)	(6)		
25 Total enlisted		14	13	13	11	51	6	
26 Aggregate		18	14	14	12	58	6	
27 Q Ambulance, ¼-ton		3				3		
28 Q Trailer, 1,400-gallon		1				1		
29 Q Truck, ½-ton		1				1		
30 Q Truck, 2½-ton, cargo		1				1		

Plate 61. T/O 4-111, April 1, 1942. Organization of the Medical Detachment, Coast Artillery Regiment, Antiaircraft, Semimobile.

1	2	3	4	5	6	7
Unit	Technician grade	Headquarters section	3 battalion sections (each)	Total	Enlisted cadre	Remarks
1 Major		1		1		
2 Captain		(d1) 2	• 1	(d1) 5		• May be first lieutenant.
3 First lieutenant		4 1		1		^b May be allotted to battalion medical sections.
4 Total commissioned		4	1	7		^d Dental.
5 Technical sergeant (673)		1		1		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
6 Staff sergeant, including		1		1		
7 Section leader (673)			(1)	(3)	(1)	
8 Corporal, including			(1)	(3)	(1)	
9 Section leader, assistant (673)			(1)	(3)	(1)	
10 Technician, grade 4				1		
11 Technician, grade 5				4		
12 Private, first class, including		13	7	13	3	
13 Private				16		
14 Battery aid man (123)			(4)	(12)		
15 Chauffeur (345)		(5)		(5)		
16 Clerk (055)		(1)		(1)		
17 Technician, dental (067)		5	(2)	(2)	(1)	
18 Technician, medical (123)		6	(1)	(1)	(1)	
19 Technician, medical (123)			(1)	(3)	(1)	
20 Technician, sanitary (196)		(1)		(1)	(1)	
21 Technician, surgical (225)		4	(1)	(1)		
22 Technician, surgical (225)		5	(1)	(1)	(1)	
23 Technician, surgical (225)			(1)	(1)	(1)	
24 Basic (521)			(1)	(1)	(4)	
25 Total enlisted		14	9	41	6	
26 Aggregate		18	10	48	6	
27 Q Ambulance			• 3		3	
28 Q Trailer, water tank, 250-gallon		1			1	
29 Q Truck, ½-ton		1			1	
30 Q Truck, 2½-ton, cargo		1			1	

Plate 62. T/O 4-151, April 1, 1942. Organization of the Medical Detachment, Coast Artillery Regiment, 155-mm Gun, Semimobile.

Infantry Regiment, Parachute. The medical detachment of the infantry regiment, parachute consists of 9 officers, 60 enlisted men (See T/O 7-31).

1	2	3	4	5	6
Unit	Technician grade	Headquarters section	3 battalions (each)	Total	Remarks
2 Major.....		1		1	
3 Captain.....		1		1	
4 First lieutenant.....		4	1	(4) 4	
5 Total commissioned.....		3	2	(4) 9	* All are parachutists and equipped with parachutes. † Dental.
6 Technical sergeant.....		1		1	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in section I, A.R. 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
7 Staff sergeant.....			1	1	
8 Sergeant.....		1		1	
9 Corporal.....			1	1	
10 Technician, grade 4.....				5	
11 Technician, grade 5.....				11	
12 Private, first class.....	including.....	7	15	15	
13 Private.....				21	
14 Clerk, general (405).....		(1)		(1)	
15 Dental (667).....		5	(1)	(1)	
16 Litter bearer (657).....			(2)	(2)	
17 Medical (409).....		5	(1)	(1)	
18 Medical (409).....			(1)	(1)	
19 Messenger (675).....			(1)	(1)	
20 Sanitary (196).....		4	(2)	(1)	
21 Surgical (225).....			(3)	(3)	
22 Surgical (225).....		5	(6)	(6)	
23 Surgical (225).....			(2)	(2)	
24 Basic (521).....					
25 Total enlisted.....		9	17	60	
26 Aggregate.....		12	19	60	
27 A Parachute *.....		12	19	60	

Plate 63. T/O 7-31, February 17, 1942. Medical Detachment, Infantry Regiment, Parachute.

CHAPTER II

THE MEDICAL REGIMENT, THE MEDICAL SQUADRON, AND THE MEDICAL BATTALIONS

Introduction. The medical regiment, the medical squadron, and the medical battalion are organic units of tactical organizations. They are organized to fit the particular type of unit served: the medical regiment for army troops and elsewhere as needed; the medical squadron for the cavalry division; and the medical battalions for the corps, infantry division, motorized division, mountain division, and the armored division.

Function. Basically, the function of these medical units is to assist in the preservation of the strength of the division, corps, or army of which they are a part. This is accomplished by:

Prompt evacuation of the non-effective sick and injured from all units of the command served.

Adequate treatment and care of the sick and injured until they can be returned to duty or evacuated to appropriate medical installations for further treatment according to their needs.

Maintaining the health of the men in the command served.

Providing medical, dental, and veterinary supplies to all units supported.

THE MEDICAL REGIMENT

Organization. The medical regiment is an organic part of army troops. It is organized into:

Regimental headquarters and band.

Headquarters and service company.

2 battalions of 3 collecting companies (identical in organization, transportation, and equipment) and 1 clearing company of 3 platoons. Each battalion is identical in organization, transportation, and equipment.

Personnel. Exclusive of the two attached chaplains, there are within the medical regiment 76 officers, 1 warrant officer, and 1,078 enlisted men, a total strength of 1,155. (See Plate 1.) According to rank and grade they are as follows:

55 *medical officers*; 1 colonel (commanding officer of medical regiment), 3 lieutenant colonels, 1 major, 26 captains and 24 lieutenants.

6 *dental officers*, all first lieutenants.

15 *medical administrative corps officers*; 2 captains, 6 first lieutenants (warrant officer may replace one of these), and 7 second lieutenants (6 of these may be replaced by warrant officers).

2 *attached chaplains*; 1 captain and 1 first lieutenant (not included in total).

1 *warrant officer*; band leader.

1078 *enlisted men*; 3 master sergeants, 9 first sergeants, 3 technical sergeants, 34 staff sergeants, 56 sergeants, 36 corporals, 48 technicians grade 4, 120 technicians grade 5, 348 privates first class, and 421 privates.

Transportation. The motor transport equipment contained in the Tables of Basic Allowances which is tabulated below takes precedence over that shown in the Tables of Organization 8-21, 8-22, 8-25, 8-67, and 8-28: (See following page).

Regimental Headquarters. Regimental headquarters is an agency of command and consists of the commander, the executive officer, the adjutant (S-1), the plans and training officer (S-3), two chaplains (attached), and certain enlisted personnel. The commander of the headquarters and service company, being unit supply officer and division medical supply officer, is also a regimental staff officer (S-4).

The regimental commander. The commanding officer of the medical regiment is directly responsible to the army commander for the efficient administration, discipline, training, and operation of the medical regiment in all situations. When he is away from regimental headquarters his command duties are performed by the executive officer. The regimental commander must maintain close liaison with the army surgeon.

	Hq & Serv Co	Bn Hq (ea)	Coll Co (ea)	Clr Co (ea)	Total Regt
Ambulance, ¾-ton, 4 x 4			12		72
Trailer, ¾-1-ton, 2 wheel, cargo ...			2	7	26
Trailer, 1-ton, 2 wheel, water tank (250-gallon)	1		1	3	13
Truck, ¼-ton 4 x 4	4	1	1	4	20
Truck, ¾-ton, 4 x 4, command	1		1		7
Truck, ¾-ton, 4 x 4, weapons carrier	1				1
Truck, 1½-ton, 4 x 4, cargo			1		6
Truck, 1½-ton, 4 x 4, cargo with winch			1		6
Truck, 2½-ton, cargo, 6 x 6	4		1	8	26
Truck, 2½-ton, 6 x 6, cargo with winch	2			3	8

This permits him to keep in close touch with the medical requirements of the tactical situation, thus enabling him to direct effectively the operation of the regiment. The surgeon submits recommendations for the employment of the medical regiment to G-4. When these recommendations are approved the commander puts them into execution.

1	2	3	4	5	6	7	8	9
Unit	Regimental head- quarters and band ^a	Headquarters and service company (T/O 8-22)	2 battalions (each) (T/O 8-25)	Total regiment	Attached chaplain	Aggregate	Enlisted cadre	Remarks
2 Colonel	1			1		1		^a Warrant officer and enlisted men in this column constitute the band. The regimental band is organized only when specifically authorized; when not present, the total and aggregate strengths of the regiment are reduced accordingly. The band is attached to headquarters and service company for administration, mess, and supply. ^b Medical Administrative Corps. ^c Warrant officer may replace these officers. ^d Dental.
3 Lieutenant colonel	1	2		3		3		
4 Major	1			1		1		
5 Captain	b 1	b 1	13	28	1	29		
6 First lieutenant		(c1) b 4	(b1 d3) 16	36	1	37		
7 Second lieutenant		b 1	b = 3	7		7		
8 Total commissioned	4	8	32	76	2	78		
9 Warrant officer	1			1		1		
10 Master sergeant		3		3		3	3	
11 First sergeant		1	4	9		9	9	
12 Technical sergeant	1	2		3		3	2	Regimental head- quarters, officer and enlisted personnel, is carried in headquarters and service company, battalion section (T/O 8-22).
13 Staff sergeant	1	5	14	34		34	26	
14 Sergeant		6	25	56		56	37	
15 Corporal		4	16	36		36	11	
16 Technician, grade 4	7	9	16	48		48	14	
17 Technician, grade 5	8	12	50	120		120	23	
18 Private, first class	11	13	162	348		348	6	
19 Private, including		21	200	421		421		
20 Basic		(7)	(35)	(77)		(77)		
21 Total enlisted	28	76	487	1,078		1,078	136	
22 Aggregate	33	84	519	1,155	2	1,157	136	
23 Q Ambulance, ¾-ton			36	72		72		
24 Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).		1	7	15		15		
25 Q Truck, ¼-ton		6	3	12		12		
26 Q Truck, ¾-ton, carry-all		1		1		1		
27 Q Truck, ¾-ton, command and reconnaissance.		2	7	16		16		
28 Q Truck, ¾-ton, weapon carrier		2	4	10		10		
29 Q Truck, 2½-ton, cargo		8	29	66		66		
30 Q Truck, 2½-ton, cargo, with winch.			6	12		12		
31 Q Truck, 2½-ton, wrecker, with winch.		2		2		2		

Plate 1. T/O 8-21, April 1, 1942. Organization of the Medical Regiment.

through the commander of the medical regiment who issues orders or instructions to his subordinate commanders.

The executive officer. The executive officer is the principal assistant and advisor of the regimental commander. He must have the full confidence of the commander and a complete knowledge of his policies. He carries on much of the routine administration of the medical regiment. He keeps the commander fully informed of all details of administration and operation.

When the commander is present the executive officer performs such duties as are assigned to him. He directs and coordinates the work of other staff officers. He obtains basic decisions from the regimental commander, makes decisions supplementary thereto, and gives the necessary instructions to the regimental staff. The executive officer supervises and coordinates the preparation of plans and orders by other staff officers and submits a completed plan to the regimental commander. He reviews and coordinates all instructions that are to be published to the command. He makes a continuous study of the medico-military situation with a view to being prepared for future contingencies.

When the commander is absent he directs all activities of the medical regiment for the commander in accordance with his policies. He meets all unforeseen situations without waiting for orders from the regimental commander; the latter is promptly notified of the action taken. In the usual case he remains at the command post of the medical regiment in the absence of the commander and directs the operations of the regiment.

The adjutant (S-1). The adjutant performs the usual work of his office in the routine administration of the regiment. Among the more important duties of his office are:

- Handling all official correspondence, except that pertaining to combat orders and instructions.

- Maintenance of the office of records for headquarters.

- Preparation and distribution of all general and special orders, except those pertaining to combat operations.

- Initiation of requisitions for replacements.

- Classification and assignment of all personnel joining the regiment.

- Operation of the regimental message center.

- Operation of the postal service.

- Command of the band.

- Direction of educational, recreational, and welfare activities.

The plans and training officer (S-3). The plans and training officer is charged, in general, with those duties which relate to the operations and training of the regiment. Specifically, his duties include:

- Keeping informed of the location, activities, state of training, and operation of all elements of the regiment.

- The preparation for the commander of all data bearing on the operations or training of the regiment including correlation of training of the regiment with various combat units.

- The preparation for the commander of plans and drafts of orders for probable operations of the regiment, including those to meet prospective or emergency situations, such as the standing operating procedures.

- The preparation and issue to subordinate units of all approved plans, orders, instructions relative to the employment of the regiment in combat and relative to training. Written orders and messages are distributed through the message center.

- The preparation of situation maps, operation maps, reports, and the war diary.

- The supervision of training under direction of the regimental commander.

The supply officer (S-4). The supply officer is also commander of the headquarters and service company. As a staff officer of the regimental commander, he is responsible for the efficient functioning of the supply system in the medical regiment. His specific responsibilities include the following:

- The procurement, transportation, storage, and issue of all supplies to the regiment and of medical supplies to all units within the command that is served.

- Accountability for all equipment and matériel in the medical regiment.
- Preparation of plans for supply to meet all foreseen contingencies.
- Recommending the utilization of transportation, and when necessary its procurement for the movement of supplies, equipment, and personnel.
- Responsibility for the collection and salvage of discarded matériel.
- Disbursement of funds for the maintenance of the regiment, excluding pay of troops and organization funds.

The chaplains. The chaplains perform the usual duties of their offices. (*Training Manual 16-205.*)

The Headquarters and Service Company, Medical Regiment

Organization. The headquarters and service company is organized into the following sections. (See Plate 2):

- Regimental headquarters.
- Personnel.
- Battalion headquarters.
- Company headquarters.
- General and medical supply.
- Motor maintenance.

Functions. The headquarters and service company has the following basic functions:

The supply of the medical regiment.

The medical supply of the entire command that is served.

The furnishing of personnel for the operation of regimental headquarters, personnel section, and battalion headquarters section.

The operation of a mess for the officers of the regimental headquarters when the latter officers are not messed with companies.

The movement and transportation of regimental headquarters.

The messing and administration of its own personnel and the personnel of the band when present.

Establishment and operation of the motor maintenance section.

Personnel. The assignment of personnel to duties within the headquarters and service company is flexible. While normal duties are assigned in each section, the amount of necessary work required in each section varies widely from day to day and in each situation. Therefore, all personnel is employed by the company commander in such a manner as to execute best the functions required of the company, due consideration being given to the training and duty requirements of the headquarters section. The personnel of the regimental headquarters section, while at all times under the administrative and disciplinary control of the headquarters and service company commander, is always at the disposition of its headquarters for assigned duties. It is a function of the headquarters and service company commander to insure that the personnel is given suitable basic training, is properly cared for and equipped, and is always available for its proper duties.

Company commander. The company commander commands the company and is responsible for its organization, training, supply, discipline, and operation.

He is regimental supply officer and as such is a staff officer of the regimental commander.

He is division medical supply officer, as such he is an assistant to the division surgeon and the division commander.

In this combined capacity of company commander and general and medical supply officer, he directs and coordinates the activities of subordinate officers, his enlisted personnel and the company equipment and transportation in such a manner as best to execute the functions of the company.

Regimental headquarters section. The personnel of the regimental headquarters section establishes and operates, under the assigned officers, the headquarters of the regiment. This section handles:

- All regimental administrative matters.
- Mail for the regiment.

	1	2	3	4	5	6	7	8	9	10	11
	Unit	Technician grade	Regimental headquarters section ^a	Personnel section	Battalion headquarters section	Company headquarters	General and medical supply section	Motor maintenance section	Total company	Enlisted cadre	Remarks
2	Colonel.....		1						1		* Regimental headquarters consists of— 1 colonel, Medical Corps, commanding officer. 1 lieutenant colonel, Medical Corps, executive officer. 1 major, Medical Corps, plans and training officer. 1 captain, Medical Administrative Corps, adjutant. ^b Medical Administrative Corps. ^c Qualified warrant officer, when available, may be used to replace these officers. ^d 1 qualified in payroll procedure; 1 qualified in morning report procedure; 1 qualified in service record procedure. When battalions of the regiment are used independently, personnel from the general and medical supply section and motor maintenance section together with necessary transportation should be assigned to the battalion. The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
3	Lieutenant colonel.....		1		2				3		
4	Major.....		1						1		
5	Captain.....		1			1			2		
6	First lieutenant.....				2	1		1	4		
7	Second lieutenant.....			1					1		
8	Total commissioned.....		4	1	4	1	1	1	12		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
9	Master sergeant, including.....		1				1	1	3	3	
10	Motor (813).....						(1)	(1)	(1)	(1)	
11	Sergeant major (502).....		(1)						(1)	(1)	
12	Supply (821).....						(1)		(1)	(1)	
13	First sergeant (585).....					1			1	1	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
14	Technical sergeant, including.....			1			1		2	2	
15	Personnel (290).....			(1)					(1)	(1)	
16	Supply (medical) (825).....						(1)		(1)	(1)	
17	Staff sergeant, including.....		2		2	1			5	4	
18	Mess (824).....					(1)			(1)	(1)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
19	Message center chief (542).....		(1)						(1)	(1)	
20	Plans and training (052).....		(1)						(1)	(1)	
21	Sergeant major (502).....				(2)				(2)	(2)	
22	Sergeant, including.....			3		2		1	6	5	
23	Clerk, general (055).....		(d3)						(3)	(3)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
24	Motor (813).....								(2)	(1)	
25	Supply (821).....					(1)		(1)	(1)	(1)	
26	Corporal, including.....				2	1	1		4	1	
27	Clerk, company (405).....				(1)				(1)	(1)	
28	Liaison agent (503).....				(2)				(2)	(2)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
29	Supply (186).....						(1)		(1)	(1)	
30	Technician, grade 4.....								9	2	
31	Technician, grade 5.....								12	12	
32	Private, first class.....								13	13	
33	Private.....								(2)	(2)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
34	Bugler (803).....					(1)			(1)	(1)	
35	Carpenter, construction (050).....					(1)			(1)	(1)	
36	Chaplain's assistant (534).....		5	(1)					(1)	(1)	
37	Chauffeur (344).....			(1)					(1)	(1)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
38	Clerk, general (055).....		4	(1)			(1)		(2)	(2)	
39	Clerk, general (055).....		5	(1)					(1)	(1)	
40	Clerk, general (055).....						(1)		(1)	(1)	
41	Clerk, mail (056).....				(1)				(1)	(1)	
42	Clerk, stock (324).....		5				(1)		(1)	(1)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
43	Clerk, stock (324).....						(1)		(1)	(1)	
44	Cook (060).....		4			(1)			(1)	(1)	
45	Cook (060).....		5			(2)			(2)	(2)	
46	Cook's helper (521).....					(2)			(2)	(2)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
47	Driver, light truck (345).....		5			(1)	(1)		(2)	(2)	
48	Driver, light truck (345).....			(2)	(1)	(4)	(4)	(1)	(14)	(14)	
49	Mechanic, automobile (014).....		4			(1)		(4)	(5)	(1)	
50	Mechanic, automobile (014).....		5					(5)	(5)	(5)	
51	Orderly (695).....			(3)	(2)				(5)	(5)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
52	Stenographer (213).....		4	(1)					(1)	(1)	
53	Basic (521).....			(1)		(2)	(2)	(2)	(7)	(7)	
54	Total enlisted.....		14	6	10	18	14	14	76	18	
55	Aggregate.....		18	7	14	19	15	15	88	18	
56	Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....					1			1		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
57	Q Truck, ¼-ton.....		2		2		1	1	6		
58	Q Truck, ¾-ton, carry-all.....		1						1		
59	Q Truck, ¾-ton, command and reconnaissance.....				2				2		
60	Q Truck, ¾-ton, weapon carrier.....					1		1	2		
61	Q Truck, 2½-ton, cargo, including.....			1		2	4	1	8		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
62	Cargo.....			(1)		(1)	(4)		(6)		
63	Gas and oil.....							(1)	(1)		
64	Mess.....					(1)			(1)		
65	Q Truck, 2½-ton, wrecker, with winch.....							2	2		

Plate 2. T/O 8-22, April 1, 1942. Organization of the Headquarters and Service Company, Medical Regiment.

Orders pertaining to field operations.

The regimental message center.

Personnel section. The personnel section handles all personnel records and correspondence for the medical regiment.

Battalion headquarters section. The commissioned personnel of each battalion headquarters section consists of the battalion commander (a medical officer) and a first lieutenant (a Medical Administrative Corps officer). The lieutenant is the battalion adjutant. The enlisted complement of each battalion headquarters section consists of 1 staff sergeant, 1 sergeant, 1 corporal and 6 privates first class or privates.

Company headquarters. The personnel of the company headquarters performs the following duties:

Administration and supply of the company.

Operation of a mess for officers of regimental headquarters and, when necessary, for those of battalion headquarters.

Operation of all transportation in the company.

Transports officers' baggage and headquarters equipment of regimental headquarters.

Arranges for shelter for officers of regimental headquarters.

General medical supply section. The personnel of the general medical supply section:

Ascertains the needs of the regiment for general supplies, and of all units in the division for medical supplies, by personal contact and by anticipating future needs.

Under direction of the supply officer, receives, checks, consolidates, and forwards requisitions.

Receives, checks, sorts and transports supplies.

Issues supplies as required.

Motor maintenance section. The personnel of the motor maintenance section establishes and operates a repair shop for first and second echelons of motor maintenance of all the vehicles with the medical regiment.

Transportation. The transportation of the headquarters and service company consists of:

1 Trailer, 1-ton, 2 wheel, water tank (250-gallon)

4 Truck, $\frac{1}{4}$ -ton, 4 x 4

1 Truck, $\frac{3}{4}$ -ton, 4 x 4, command

1 Truck, $\frac{3}{4}$ -ton, 4 x 4, weapons carrier

4 Truck, $2\frac{1}{2}$ -ton, cargo, 6 x 6

2 Truck, $2\frac{1}{2}$ -ton, 6 x 6, cargo with winch

The Medical Battalion, Medical Regiment

Organization. Each of the two battalions of the medical regiment consists of 32 officers and 487 enlisted men. Each battalion is divided functionally into:

Battalion headquarters.

Three collecting companies, identical in organization, transportation and equipment.

One clearing company.

Functions. This battalion establishes and operates the collecting stations, ambulance service, and clearing stations during combat. The battalion proceeds to the place designated in the regimental order from which it sends forward one or more of its companies to the locations designated in the regimental order for the station sites. Units of the battalion may be utilized as reinforcing units for the division medical service.

Personnel. The distribution of personnel of the Medical Battalion of the Medical Regiment is shown in Plate 3. The personnel consists of 1 lieutenant colonel, 13 captains (Medical Corps), 16 first lieutenants (13 Medical Corps and 3 Dental Corps), 3 second lieutenants (Medical Administrative Corps), 4 first sergeants, 14 staff sergeants, 25 sergeants, 16 corporals, 16 technicians grade 4, 50 technicians grade 5, 162 privates first class and 200 privates. The battalion headquarters which consists of 1 lieutenant colonel (Medical Corps) and 1 first lieutenant (Medical Administrative

Corps) are not included in the totals since these officers are carried in the strength of the Headquarters and Service Company of the regiment.

Battalion Headquarters. The battalion headquarters consists of the battalion commander, the adjutant, 1 staff sergeant, 1 corporal, 3 privates first class or privates.

	1	2	3	4	5	6	7
1	Unit	Battalion headquarters * (T/O 8-22)	3 collecting companies each (T/O 8-67)	Clearing company (T/O 8-28)	Total battalion	Enlisted cadre	Remarks
2	Lieutenant colonel.....	(1)					
3	Major.....						
4	Captain.....		2	7	13		
5	First lieutenant.....	(b 1)	2	(43) 10	16		* Battalion headquarters (column 2) is not shown in total (column 5) since it is carried in the headquarters and service company of regiment.
6	Second lieutenant.....		b 1		3		^b Medical Administrative Corps.
7	Total commissioned.....	(2)	5	17	32		^d Dental.
8	First sergeant.....		1	1	4	4	
9	Staff sergeant.....	(1)	3	5	14	11	
10	Sergeant.....		6	7	25	16	
11	Corporal.....	(1)	4	4	16	5	
12	Technician, grade 4.....		2	10	16	6	
13	Technician, grade 5.....		8	26	50	14	
14	Private, first class.....		35	57	162		
15	Private, including.....	(3)	42	74	200	3	
16	Basic.....	(6)	(17)	(35)			
17	Total enlisted.....	(5)	101	184	487	59	
18	Aggregate.....	(7)	106	201	519	59	
19	Q Ambulance, ¼-ton.....		12		36		
20	Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....		1	4	7		
21	Q Truck, ¼-ton.....	(1)	1		3		
22	Q Truck, ¼-ton, command and reconnaissance.....	(1)	1	4	7		
23	Q Truck, ¼-ton, weapon carrier.....		1	1	4		
24	Q Truck, ½-ton, cargo.....		3	20	29		
25	Q Truck, 2½-ton, cargo, with winch.....		1	3	6		

Plate 3. T/O 8-25, April 1, 1942. Organization of the Medical Battalion, Medical Regiment.

Battalion commander. The battalion commander decides how individual companies are to be used in the execution of an assigned mission and supervises their movements to position. He directs and supervises the activities of the companies and coordinates their efforts. He maintains close personal touch with the situation in his battalion and keeps the regimental commander informed of changes. He prepares and keeps up-to-date plans to meet possible changes in the situation and makes recommendations to the regimental commander at appropriate times. When sudden or unexpected changes in the tactical situation demand immediate action, he makes the decision himself and notifies the regimental commander at once of the action taken. He works in close association with the commanders of other medical battalions with which his battalion is operating.

Transportation. The transportation of the battalion headquarters consists of one ¼-ton truck.

The Collecting Company. There are three collecting companies in each battalion.

Organization. (See Plate 3). The collecting company is organized into a company headquarters, a station platoon, and a collecting platoon. (See Plate 4).

Functions. The collecting company has the following functions:

During and after combat, the movement by litter-carry of casualties to a collecting station from regimental and battalion aid stations, and from the field when for any reason this is necessary, and their sorting, temporary treatment, and preparation for evacuation by ambulance to a clearing station. Only emergency treatment is given at the collecting station.

Establishment and operation of march collecting posts during troop movements.

Attachment of a collecting company or detachment thereof to security detachments such as advance, flank, and rear guards.

Sanitary functions.

The transportation of casualties from collecting stations.

When practicable, the transportation of casualties from regimental aid stations, battalion aid stations, or other advanced loading posts to the clearing station.

The transmission of messages along ambulance routes.

The transportation of medical personnel and supplies forward to medical installations being evacuated.

Command. The collecting company is an integral part of the medical battalion, and its technical or tactical employment rests, therefore, with the battalion commander, subject to the orders of the regimental commander.

1	2	3	4	5	6	7	8	9
Unit	Technician grade	Company headquarters	Station platoon	Litter bearer section	Ambulance section	Total company	Enlisted cadre	Remarks
2 Captain.....		1	1			2		
3 First lieutenant.....			1	1		2		
4 Second lieutenant.....					* 1	1		
5 Total commissioned.....		1	2	1	1	5		* Medical Administrative Corps.
6 First sergeant (585).....						1	1	* Drives truck, 1½-ton, in addition to other duties.
7 Staff sergeant, including.....			1			1	3	The serial number symbol shown in parentheses is an inseparable part of the specialist designation.
8 Mess (824).....		(1)				(1)	(1)	A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-28. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
9 Platoon leader (651).....			(1)		(1)	(2)	(2)	
10 Sergeant, including.....		(1)	1	1	1	4	6	
11 Liaison agent (433).....		(1)				(1)	(1)	
12 Motor (813).....		(1)				(1)	(1)	
13 Section leader (682).....			(1)	(1)	(1)	(3)	(3)	
14 Supply (821).....		(1)				(1)	(1)	
15 Corporal, including.....		1				4	1	
16 Assistant section leader (682).....			(1)	(1)	(1)	(3)	3	
17 Clerk, company (405).....		(1)				(1)	(1)	
18 Technician, grade 4.....						2	1	
19 Technician, grade 5.....						8	3	
20 Private, first class.....			11	12	39	26	42	
21 Private.....							35	
22 Bugler (803).....		(1)				(1)	(1)	
23 Cook (060).....		4	(1)			(1)	(1)	
24 Cook (060).....		5	(1)			(1)	(1)	
25 Cook's helper (821).....		(2)				(2)	(2)	
26 Driver, light truck (345).....		5	(2)	(2)		(4)	(4)	
27 Driver, light truck (345).....		5	(1)			(12)	(13)	
28 Litter bearer (857).....				(36)		(36)	(36)	
29 Mechanic, automobile (014).....		4	(1)			(91)	(1)	
30 Mechanic, automobile (014).....		5	(1)			(1)	(1)	
31 Orderly (695).....		(1)				(1)	(1)	
32 Orderly, ambulance (696).....						(12)	(12)	
33 Technician, medical (123).....		5		(1)		(1)	(1)	
34 Technician, medical (123).....				(2)		(2)	(2)	
35 Technician, sanitary (196).....				(2)		(2)	(2)	
36 Technician, surgical (225).....		5		(1)		(1)	(1)	
37 Technician, surgical (225).....				(2)		(2)	(2)	
38 Basic (821).....			(1)	(2)	(3)	(6)	(6)	
39 Total enlisted.....		17	15	41	28	101	14	
40 Aggregate.....		18	17	42	29	106	14	
41 Q Ambulance, ½-ton.....						12	12	
42 Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....		1				1	1	
43 Q Truck, 1½-ton.....					1	1	1	
44 Q Truck, ½-ton, command.....						1	1	
45 Q Truck, ½-ton, weapon carrier.....		1				1	1	
46 Q Truck, 2½-ton, cargo.....		1	2			3	3	
47 Q Truck, 2½-ton, cargo, with winch.....		1				1	1	

Plate 4. T/O 8-67, April 1, 1942. Organization of the Collecting Company, Medical Battalion.

When any part of a collecting company is attached for duty to a security detachment, or to a detached force, the command thereof passes to the commander of the security detachment or detached force. A detachment of the medical regiment composed of two or more units is commanded by the senior officer present with the detachment.

Litter-bearer elements of the collecting company engaged in clearing casualties from a regimental or battalion area normally function under their own commanding officer, but where special conditions make it advisable litter bearers from a collecting company, by specific authority of the division commander, may be placed temporarily under the immediate command of the surgeon in whose area they are operating.

Company headquarters. Company headquarters consists of such commissioned and enlisted personnel as required for the command, administration, supply and first echelon motor maintenance of the company as a whole.

Company headquarters maintains at all times an office for the administration and supply of the company, including the preparation of reports, returns, requisitions, and

correspondence. The normal duty assignments of headquarters personnel are shown in Plate 4. The company commander may detail his officers for additional company duties, as follows:

Supply officer, who is responsible for the procurement, storage, and distribution of all supplies and equipment.

Mess officer, who is responsible for the procurement of rations and the operation of the company mess.

Transportation officer, who is responsible for the maintenance of the motor transport and ambulance service.

The *personnel* of company headquarters consists of 1 officer and 17 enlisted men.

The *collecting station platoon* is charged with the establishment and operation of the collecting station for the reception, sorting, emergency treatment, feeding, and preparation of the sick, gassed, and wounded for evacuation to a clearing station. When at station this section is reinforced as necessary for company headquarters.

The *liaison section* is charged with the establishment and maintenance of communications (contact) with the regimental medical detachments attached to combat units in the area of operation covered by the collecting company.

Collecting platoon. The collecting platoon consists of a litter bearer section and an ambulance section. The litter bearer section carries litter cases to the collecting station from the aid stations and, when necessary, from the field in rear of the battalion aid stations, in their areas of operation. Litter bearers operate the company's wheeled-litter-carriers whenever their use is practicable. They perform such emergency treatment for casualties handled by them as may be necessary. The section is commanded by a first lieutenant. The ambulance section commanded by a second lieutenant of the Medical Administrative Corps transports casualties both recumbent and walking wounded from the collecting station to the clearing station and may transport the casualties classified as non-transportable cases to the installation provided for their care if that installation is in the vicinity of the clearing station. When the situation permits, the section will operate ambulances forward of the collecting station in order to relieve litter bearers of as much labor as possible.

Equipment and supply. The equipment for a collecting company is prescribed in Tables of Basic Allowances, War Department and the Basic Equipment List, Medical Department.

The transportation of the collecting company consists of: (See T/BA No. 8).

12 ambulances, $\frac{3}{4}$ -ton, 4 x 4	1 truck, $\frac{3}{4}$ -ton, 4 x 4, command
2 trailer, $\frac{3}{4}$ -1-ton, 2 wheel, cargo	1 truck, 1 $\frac{1}{2}$ -ton, 4 x 4, cargo
1 trailer, 1-ton, 2 wheel, water tank (250-gallon)	1 truck, 1 $\frac{1}{2}$ -ton, 4 x 4, cargo with winch
1 truck, $\frac{1}{4}$ -ton, 4 x 4	1 truck, 2 $\frac{1}{2}$ -ton, cargo, 6 x 6

Class I, II, III and IV supplies (less medical supplies) are obtained by formal or informal requisition on the regimental supply officer. Class I supplies are normally delivered to bivouac areas or collecting stations by the headquarters and service company.

Medical supplies are obtained by formal or informal requisition on the regimental supply officer. Except during combat they are normally drawn by company personnel and transport at the army medical distributing point.

The Clearing Company, Medical Regiment

Organization. A clearing company of a battalion of the medical regiment consists of 17 officers and 184 enlisted men. It is organized to provide temporary care and treatment of casualties with the minimum of personnel and equipment without sacrificing mobility. In this organization, provisions are made for expansion and cooperative action with other medical installations. The company establishes and operates the clearing station during combat and at such other times as a station is required. One or more platoons may be utilized.

Personnel. The strength and the distribution of the personnel are indicated in Plate 5. It consists of: seven captains, ten first lieutenants (three dental officers, one may be a

Medical Administrative Corps officer), one first sergeant, five staff sergeants, seven sergeants, four corporals, ten technicians grade 4, twenty-six technicians grade 5, fifty-seven privates first class, and seventy-four privates.

Headquarters. Company headquarters consists of the company commander, the adjutant, one first sergeant, two staff sergeants, four technicians grade 4, five technicians grade 5, and eleven privates first class, or privates.

	1	2	3	4	5	6	7
	Unit	Technician grade	Company headquarters	3 clearing platoons (each)	Total company	Enlisted cadre	Remarks
2	Captain.....		1	2	7		
3	First lieutenant.....		1	(d 1) 3	10		
4	Total commissioned.....		2	5	17		* May be Medical Administrative Corps.
5	First sergeant (585).....		1		1	1	* Dental.
6	Staff sergeant, including.....		2	1	5	2	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
7	Mess (824).....		(1)	(1)	(1)	(1)	
8	Motor (813).....		(1)	(1)	(1)	(1)	
9	Platoon leader (651).....		(1)	(1)	(3)		
10	Sergeant, including.....		1	2	7	1	
11	Section leader (652).....		(2)	(6)	(1)	(1)	
12	Supply (821).....		(1)	(1)	(1)	(1)	
13	Corporal, including.....		1	1	4	2	
14	Clerk, admission (055).....		(1)	(1)	(3)	(1)	
15	Clerk, company (405).....		(1)	(1)	(1)	(1)	
16	Technician, grade 4.....				10	3	
17	Technician, grade 5.....		20	49	26	5	
18	Private, first class.....				57	3	
19	Private.....				74		
20	Bugler (803).....		(1)		(1)		
21	Cook (060).....	4	(3)		(3)	(1)	
22	Cook (060).....	5	(3)		(3)	(1)	
23	Cook's helper (521).....		(2)		(2)		
24	Driver, light truck (345).....	6	(1)	(2)	(7)		
25	Driver, light truck (345).....		(3)	(6)	(21)		
26	Mechanic, automobile (014).....	4	(1)		(1)		
27	Mechanic, automobile (014).....	5	(1)		(1)		
28	Pharmacist (149).....	4		(1)	(3)	(1)	
29	Orderly (695).....		(3)		(3)		
30	Technician, dental (067).....	5		(1)	(3)	(1)	
31	Technician, medical (123).....	5		(2)	(6)	(1)	
32	Technician, medical (123).....			(4)	(12)	(2)	
33	Technician, sanitary (196).....			(2)	(6)	(1)	
34	Technician, surgical (225).....	4		(1)	(3)	(1)	
35	Technician, surgical (225).....	5		(2)	(6)	(2)	
36	Technician, surgical (225).....			(5)	(19)		
37	Ward attendant, medical (303).....			(9)	(27)		
38	Ward attendant, surgical (303).....			(9)	(27)		
39	Basic (521).....		(2)	(5)	(17)		
40	Total enlisted.....		25	53	184	17	
41	Aggregate.....		27	58	201	17	
42	Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....		1	1	4		
43	Q Truck, 3/4-ton, command and reconnaissance.....		1	1	4		
44	Q Truck, 3/4-ton, weapon carrier.....		2		1		
45	Q Truck, 2 1/2-ton, cargo.....			6	20		
46	Q Truck, 2 1/2-ton, cargo, with winch.....				1	3	

Plate 5. T/O 8-28, April 1, 1942. Organization of the Clearing Company, Medical Regiment.

Company commander. The commander, in compliance with instructions contained in the regimental field order, prescribes the time and route of movement of the clearing company to its prospective location. He designates the platoon or platoons to establish the clearing station or stations, selects the particular site or sites for them, designates the amount of shelter to erect or utilize, and supervises the functioning of the clearing station, when two or more platoons are functioning together. He designates the platoon or platoons to be held in reserve, if any, and their position. He may assign tasks to reserve platoons in rendering any assistance necessary to the active platoons or preliminary preparation of their own prospective sites for later establishment.

The Clearing Platoon. There are three platoons in each clearing company of the medical regiment. They are designated as 1st, 2d, and 3d platoon, respectively.

Organization. The clearing platoon is organized to provide temporary care and treatment of casualties, and to prepare them for further evacuation. A competent coordinating head and the division of the platoon into essential groups and departments with responsible and adequately trained personnel are of prime importance. The salient requirements are:

An orderly plan for admitting, feeding, and recording patients and of sorting them for operation, treatment, and evacuation.

Systematic methods which guarantee speed and precision in:

Packing and unpacking of equipment and supplies.

Loading and unloading of transport.

Erection and striking of tentage.

Installation of equipment.

Provisions for expansion and cooperative action with other clearing platoons and companies.

The apportionment of personnel shown in Plate 5 is based on the duties which must be performed in order that the unit may perform its combat functions. Flexibility within the organization is necessary and demands the shifting of personnel from one duty to another as circumstances require. It is a function of the commander to train personnel by temporary interchange in departments so that emergencies can be met successfully without undue embarrassment.

Functions. The clearing platoon exists primarily for the sorting and temporary care of battle casualties in the combat area and operates a clearing station for sick and wounded requiring evacuation from the area served by the company during combat. In temporary camps and march bivouacs it may furnish temporary hospitalization for the care of the sick. Its operation is based on the principle that casualties shall be evacuated from the combat area to the rear as safely, rapidly, and continuously as human agencies will permit. Being essentially a mobile unit operating with combat forces, it has neither the personnel nor equipment necessary to provide definitive or prolonged treatment for serious cases. Its functions may include treatment of special cases—surgical, medical, or gassed.

Command. The clearing platoon is an integral part of the medical battalion. Its technical or tactical employment rests, therefore, with the battalion commander. Close cooperation with collecting companies and with units evacuating the clearing station is essential if efficient operation is to be obtained.

Platoon headquarters. Platoon headquarters consists of such commissioned and enlisted personnel as is required for the command, administration, and supply of the platoon as a whole.

Technical personnel. Technical personnel of each clearing platoon consists of 4 medical officers (2 captains and 2 lieutenants), 1 dental officer (lieutenant), 1 staff sergeant, 2 sergeants, 1 corporal, 2 technicians grade 4, 7 technicians grade 5, and 40 privates first class or privates. A sergeant is section leader, and there is a technician in charge of each of the following departments: admission, surgical, shock and bath. The enlisted men are technically trained personnel for service throughout the clearing station (see Plate 5) and include: clerks, pharmacist, dental, medical, surgical and sanitary technicians; and attendants. All the enlisted men are valuable technical assistants to the medical and dental officers.

Transportation of the Clearing Company. The *transportation* of the clearing company consists of:

7 trailer, $\frac{3}{4}$ -1-ton, 2 wheel, cargo

3 trailer, 1-ton, 2 wheel, water tank, (250-gallon)

4 truck, $\frac{1}{4}$ -ton, 4 x 4

8 truck, $2\frac{1}{2}$ -ton, cargo, 6 x 6

3 truck, $2\frac{1}{2}$ -ton, 6 x 6, cargo with winch

The *transportation personnel* of company headquarters consists of 1 staff sergeant (motor), and 1 technician grade 4, 2 technicians grade 5. This personnel is charged with maintenance of the motor transportation for the clearing company. The technicians are automobile mechanics.

The *equipment* for a clearing company is prescribed by Tables of Allowances and by the Equipment List. It is equipped to operate 3 clearing stations. To insure mobility, many articles deemed necessary for fixed hospitals are of necessity eliminated. Although designed for the care and treatment of all classes of casualties, particular provisions are

made for the needs of emergency surgical cases. All equipment is packed in standard containers and consists, basically, of multiples of standard Medical Department field equipment, plus miscellaneous supplies.

The equipment for the clearing station must be loaded on the transportation in a manner that will permit a rapid establishment of the station, particularly of those departments that function in all tactical situations. In so far as practicable, the complete equipment and supplies for each department of the basic unit should be carried on the same truck.

Functional or operating organization. The functional or operating organization of the clearing platoon is discussed later in Chapter III under Employment of the Clearing Company.

THE MEDICAL SQUADRON FOR CAVALRY DIVISIONS

Organization. The medical squadron is an organic part of the cavalry division. (See Plate 6.) It consists of:

Squadron headquarters.

Clearing troop.

Headquarters detachment.

Veterinary troop.

Collecting troop.

1	2	3	4	5	6	7	8	9
Unit	Squadron headquarters (T/O 8-85)*	Headquarters detach- ment (T/O 8-86)	Collecting troop (T/O 8-87)	Clearing troop (T/O 8-87)	Veterinary troop (T/O 8-88)	Total squadron (T/O 8-89)	Enlisted cadre	Remarks
1 Lieutenant colonel.....	(1)	1				1		
2 Major.....	(1)	1				1		
3 Captain.....	(1)	2	1		1	5		
4 Lieutenant.....	(1)	2	6	2	13	17		
5								
6 Total commissioned.....	(4)	6	7	7	4	24		* Personnel shown in column 2 is included in column 3. Personnel shown in column includes—
7 Master sergeant.....		1				1	1	1 lieutenant colonel,
8 First sergeant.....		1	1	1	1	4	4	MC, command-
9 Technical sergeant.....		3				3	3	ing officer.
10 Staff sergeant.....		4	3	4		13	13	1 major, MC.
11 Sergeant.....		5	7	8	7	27	10	1 captain, chaplain.
12 Corporal.....		2	7	7	1	17	4	1 lieutenant, MAC,
13 Technician, grade 4.....		4	4	7	4	19	8	squadron adju-
14 Technician, grade 5.....		10	12	15	9	46	7	tant and person-
15 Private, first class.....		6	46	22	16	89		nel officer.
16 Private, including.....		9	56	30	22	117		b Medical Administra-
17 Basic.....		(3)	(10)	(8)	(6)	(27)		tive Corps.
18 Total enlisted.....		42	137	93	64	336	50	c Chaplain.
19 Aggregate.....		48	144	100	68	360	50	d Dental.
20 Ambulance, ½-ton.....			24			24		e Veterinary Corps.
21 Animal, including.....					16	16		f Mounted on horse.
22 Horse, draft.....					(4)	(4)		The serial number
23 Horse, riding.....					(12)	(12)		symbol shown in paren-
24 Q Semitrailer, 6-ton, combination animal and cargo carrier.....								theses is an inseparable
25 Q Trailer, 1-ton, 2-wheel, cargo.....					4	4		part of the specialist
26 Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....		1	1	1	1	4		designation. A number
27 Q Trailer, 2-wheel, 2-horse van.....					2	2		below 500 refers to an
28 Q Truck, ½-ton.....		2	1	1	2	6		occupational specialist
29 Q Truck, ¾-ton, command and reconnaissance.....		2	3	3	1	9		whose qualification an-
30 Q Truck, ¾-ton, weapon carrier.....		2	1	3		6		alysis is found in AR
31 Q Truck, 1½-ton, cargo.....		4	3	7	4	18		615-28. A number above
32 Q Truck, 1½-ton, cargo, with winch.....		2		3		6		500 refers to a military
33 Q Truck, 4- to 5-ton, tractor.....					4	4		occupational specialist
								listed in Circulars Nos.
								14 and 67 War Depart-
								ment, 1942.

Plate 6. T/O 8-85, April 1, 1942. Organization of the Medical Squadron, Cavalry Division.

Personnel. The personnel of the Division Surgeon's office is included in Division Headquarters. There are within the medical squadron 24 officers and 336 enlisted men, a total strength of 360. According to rank and grade, they are as follows:

15 medical officers: 1 lieutenant colonel (commanding officer of the medical squadron), 1 major, 2 captains, 11 lieutenants.

2 dental officers: first lieutenants.

2 medical administrative corps officers: 1 captain, 1 lieutenant.

4 *veterinary officers*: 1 captain (commanding officer of the veterinary troop), and 3 first lieutenants.

1 *chaplain*: a captain.

336 *enlisted men*: 1 master sergeant (squadron sergeant major), 4 first sergeants, 3 technical sergeants, 13 staff sergeants, 27 sergeants, 17 corporals, 19 technicians grade 4, 46 technicians grade 5, 89 privates first class and 117 privates.

Transportation. The motor transport equipment contained in the Tables of Basic Allowances which is tabulated below takes precedence over that shown in the Tables of Organization 8-85, 8-86, 8-87, 8-88 and 8-89:

	Hq Det	Coll Tr	Clr Tr	Vet Tr	Total Sqdn
Ambulance, $\frac{3}{4}$ -ton, 4 x 4		24			24
Semi-trailer, 6-ton, combination, animal and cargo carrier				4	4
Trailer, 2 wheel, 2 horse van				2	2
Trailer, $\frac{3}{4}$ -1-ton, 2 wheel, cargo	2	1	2		5
Trailer, 1-ton, 2 wheel, water tank, (250-gallon)	1	1	3		5
Truck, $\frac{1}{4}$ -ton, 4 x 4	1	3	3	2	9
Truck, $\frac{3}{4}$ -ton, 4 x 4, command	1	1	1	1	4
Truck, $\frac{3}{4}$ -ton, 4 x 4, weapons carrier	1		1		2
Truck, 2 $\frac{1}{2}$ -ton, cargo, 6 x 6	3	1	4	1	9
Truck, 2 $\frac{1}{2}$ -ton, 6 x 6, cargo with winch	1	1	1	1	4
Truck, 4-5-ton, 4 x 4, tractor				4	4

Squadron Headquarters. Squadron headquarters is an agency of command and includes the commander, the executive officer, the adjutant and personnel officer, a medical administrative corps officer, the chaplain, and certain enlisted personnel who are members of the headquarters detachment.

The squadron commander. The commanding officer of the medical squadron is directly responsible to the division commander for the efficient administration, discipline, training, and operation of the medical squadron in all situations. His duties are analogous to those of the commanding officer of the medical battalion of an infantry division.

The executive officer. The executive officer of the medical squadron is the principal assistant and advisor of the squadron commander. He carries on the routine administration of the medical squadron, and his duties as a whole are identical to those of the executive officer of the medical battalion, of an infantry division.

The Headquarters Detachment, Medical Squadron

Organization. The headquarters detachment consists of 6 officers and 42 enlisted men. (See Plate 7.) It is divided into five sections:

Squadron headquarters.	Detachment headquarters.
Personnel section.	General and medical supply section.
Squadron headquarters detachment.	Motor maintenance section.

Functions. The headquarters detachment has the following basic functions:

The supply of the medical squadron.

The medical supply of the entire division.

The assignment of personnel for the operation of squadron headquarters.

Personnel. For strength of personnel and its distribution see Plate 7. It is employed by the detachment commander in such a manner as to best execute the functions required of the detachment, due consideration being given to the training and duty requirements of the squadron headquarters detachment.

Detachment commander. The commanding officer of the headquarters detachment is responsible for its organization, training, supply, discipline, and operation.

He is the squadron supply officer and as such is a staff officer of the squadron commander.

He is division medical supply officer and as such is an assistant to the division surgeon.

In this combined capacity of detachment commander and general and medical supply officer, he directs and coordinates the activities of his enlisted personnel and the detachment equipment and transportation in such a manner as to best execute the functions of the company.

Personnel section. The personnel section consists of the personnel technical sergeant, 3 sergeants (clerks, general), 1 technician grade 5 (clerk, general). They handle personnel records and correspondence pertaining thereto.

Squadron headquarters detachment. The squadron headquarters detachment consists of 11 enlisted men. Certain of these enlisted men operate the squadron headquarters, handling squadron administrative matters, correspondence, mail, orders pertaining to field operations, and the message center.

Detachment headquarters. Detachment headquarters consists of 1 officer and 11 enlisted men. The personnel handles administrative matters pertaining to the headquarters detachment.

General and medical supply section. The general and medical supply section consists of 1 officer and 9 enlisted men. They handle all general (unit) and medical supplies and transportation pertaining to these supplies. They receive, check, transport, sort, and issue all supplies.

Motor Maintenance Section. The motor maintenance section consists of 5 enlisted men; 1 motor sergeant (technical sergeant), 2 technicians grade 4, 2 technicians grade 5. The technicians are automobile mechanics (014). See Plate 7.

Transportation. The transportation of the headquarters detachment consists of:

- 2 trailers, $\frac{3}{4}$ -ton, 2 wheel, cargo
- 1 trailer, 1-ton, 2 wheel, water tank (250-gallon)
- 1 truck, $\frac{1}{4}$ -ton, 4 x 4
- 1 truck, $\frac{3}{4}$ -ton, 4 x 4, command
- 1 truck, $\frac{3}{4}$ -ton, 4 x 4, weapons carrier
- 3 trucks, $2\frac{1}{2}$ -ton, cargo, 6 x 6
- 1 truck, $2\frac{1}{2}$ -ton, 6 x 6, cargo with winch

Collecting Troop, Medical Squadron

Organization. The collecting troop of the medical squadron consists of 7 officers and 137 enlisted men. (See Plate 8.) It is divided for functional purposes into:

Troop headquarters.

2 collecting platoons, identical in organization, equipment, and transportation.

Functions. The collecting troop is capable of establishing and operating 2 collecting stations. It evacuates the squadron aid stations and collects casualties in rear of the squadron aid stations. It provides temporary care and treatment for casualties at the collecting stations. The collecting troop also evacuates the collecting stations, transporting the casualties to the clearing station by means of its ambulance section. Its functions, therefore, are analogous to the functions of the collecting company of the medical battalion of the infantry division. However, the cavalry division being a highly mobile unit, care and treatment of patients must be more temporary, and the collecting troop must be ready to make frequent and rapid moves.

Personnel. The personnel strength of the collecting troop and its distribution are shown in Plate 8. It includes 1 captain, 6 first lieutenants, 1 first sergeant, 4 staff sergeants, 7 sergeants, 7 corporals, 4 technicians grade 4, 12 technicians grade 5, 46 privates first class, and 56 privates.

Troop Headquarters. The headquarters of the collecting troop is a tactical and an administrative unit. It consists of 1 medical officer (a captain, troop commander) and 19 enlisted men. Its functions are analogous to those of the headquarters of the collecting company of the medical battalion of the infantry division.

Troop commander. The troop commander is responsible for the administration and operation of the collecting troop. He is responsible for the evacuation of the squadron

aid stations, providing a place of temporary treatment at collecting stations, and evacuating collected casualties to the clearing station by means of motor ambulances.

Collecting platoon. There are 2 collecting platoons in the collecting troop. Each collecting platoon consists of:

A collecting station section.

A bearer section.

An ambulance section.

Each collecting platoon is capable of operating a collecting station and furnishing transportation for the evacuation of casualties from the squadron aid stations to the clearing station. Each platoon has 3 officers and 59 enlisted men.

1	2	3	4	5	6	7	8	9	10	11
Unit	Technician grade	Squadron headquarters	Personnel section	Squadron headquarters	Detachment headquarters	General and medical supply section	Motor maintenance section	Total detachment	Enlisted cadre	Remarks
Lieutenant colonel.....	1							1		
Major.....	1							1		
Captain.....	a 1				b 1			2		* Chaplain.
Lieutenant.....	b 1				b 1			2		* Medical Administrative Corps.
Total commissioned.....	4			1	1			6		* Squadron adjutant and personnel officer.
Master sergeant, including.....		1						1		
Sergeant major (502).....		(1)						(1)	(1)	
First sergeant (585).....				1				1	1	
Technical sergeant, including.....		1			1			2	2	
Motor (813).....						(1)	(1)	(1)	(1)	
Personnel (816).....		(1)						(1)	(1)	
Supply (821).....					(1)			(1)	(1)	
Staff sergeant, including.....					(1)			(1)	(1)	
Mess (824).....								(1)	(1)	
Supply (825).....					(1)			(1)	(1)	
Sergeant, including.....		3	1		1			5	1	
Clerk, general (055).....		(3)						(3)		
Clerk, stock (324).....					(1)			(1)		
Motor (813).....			(1)					(1)	(1)	
Corporal, including.....		1	1					2	1	
Clerk, general (405).....				(1)				(1)	(1)	
Duty (566).....								(1)		
Technician, grade 4.....								4	1	
Private, first class.....		1	1	8	8	6	4	5	1	
Private.....								9		
Bugler (900).....				(1)				(1)		
Chaplain's assistant (534).....	5	(1)						(1)		
Clerk, general (055).....	5	(1)	(1)	(1)		(1)		(3)		
Cook (060).....	4		(1)	(1)				(1)	(1)	
Cook (060).....	5			(1)		(1)		(1)		
Cook's helper (921).....				(1)				(1)		
Chauffeur (345).....	5				(2)	(2)		(2)		
Chauffeur (345).....			(2)	(2)				(6)		
Mechanic, automobile (014).....	4				(1)		(2)	(2)		
Mechanic, automobile (014).....	5				(2)		(2)	(3)	(1)	
Orderly (695).....			(2)		(1)			(2)		
Repairman, utility (121).....			(1)					(1)		
Stenographer (213).....	4		(1)					(1)		
Basic (521).....			(1)	(1)	(1)			(3)		
Total enlisted.....		1	5	11	11	9	5	42	11	
Aggregate.....		5	5	11	12	10	5	48	11	
Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....					1			1		
Q Trailer, 1-ton, 2-wheel, cargo.....					1			1		
Q Truck, ¼-ton.....				1	1			2		
Q Truck, ¾-ton, command and reconnaissance.....				1	1			2		
Q Truck, ¾-ton, weapon carrier.....					1	1	1	2		
Q Truck, 1½-ton, cargo.....					1	3		4		
Q Truck, 1½-ton, cargo, with winch.....							2	2		

Plate 7. T/O 8-86, April 1, 1942. Organization of the Headquarters Detachment, Medical Squadron.

The collecting *station section* operates the collecting station and performs the duties incident thereto. The section has 1 officer and 13 enlisted men.

The *bearer section* evacuates the casualties from the squadron aid stations to the collecting station. Contact is maintained with the regimental medical detachments of the cavalry regiments and supporting artillery. The section has 1 officer and 20 enlisted men. No transportation is provided.

The *ambulance section* operates the ambulance service within the zone of the unit served. Each section has 26 enlisted men: 1 sergeant (the section leader), 1 corporal

(assistant section leader), and 24 privates first class or privates. The privates first class and privates are ambulance orderlies and chauffeurs. Each section has twelve $\frac{3}{4}$ -ton ambulances.

Equipment, Supplies, and Transportation of the Collecting Troop. The *equipment* for a collecting troop is authorized by Tables of Basic Allowances and prescribed by the Equipment List. It consists of drugs, surgical instruments, simple sterilizing apparatus, blankets, litters, tentage, and such other supplies necessary for temporary treatment of casualties.

General and medical supplies are received through the general and medical supply section of the headquarters detachment of the medical squadron.

The transportation of the collecting troop consists of:

- 24 ambulances, $\frac{3}{4}$ -ton, 4 x 4
- 1 trailer, $\frac{3}{4}$ -1-ton, 2 wheel, cargo
- 1 trailer, 1-ton, 2 wheel, water tank (250-gallon)
- 3 trucks, $\frac{1}{4}$ -ton, 4 x 4
- 1 truck, $\frac{3}{4}$ -ton, 4 x 4, command
- 1 truck, $2\frac{1}{2}$ -ton, cargo, 6 x 6
- 1 truck, $2\frac{1}{2}$ -ton, 6 x 6, cargo with winch

	1	2	3	4	5	6	7	8	9	10
	Unit	Technician grade	2 collecting platoons (each)					Total	Enlisted cadre	Remarks
		Troop headquarters	Station section	Bearer section	Ambulance section	Total platoon				
1	Unit									
2	Captain	1					1			
3	Lieutenant		1	1	1	3	6			
4	Total commissioned		1	1	1	3	7			The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose occupational analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
5	First sergeant (585)		1				1	1		
6	Staff sergeant, including		2			1	4	4		
7	Mess (824)		(1)				(1)	(1)		
8	Motor (813)		(1)				(1)	(1)		
9	Platoon leader (651)		(1)			(1)	(2)	(2)		
10	Sergeant, including		1	1	1	3	7	5		
11	Section leader (652)		(1)	(1)	(1)	(3)	(6)	(4)		
12	Supply (821)		(1)				(1)	(1)		
13	Corporal, including		1				1	1		
14	Assistant section leader (652)		(1)	(1)	(1)	(3)	(6)	(1)		
15	Clerk, general (405)		(1)				(1)	(1)		
16	Technician, grade 4							2		
17	Technician, grade 5							2		
18	Private, first class	including	14	10	18	24	52	12		
19	Private							46		
20	Bugler (803)		(1)				(1)			
21	Clerk, general (055)		5	(1)			(1)	(2)		
22	Cook (060)		5	(1)			(1)	(1)		
23	Cook (060)		5	(1)			(1)	(1)		
24	Cook's helper (521)		5	(2)			(2)			
25	Chauffeur (345)		5	(1)			(1)			
26	Chauffeur (345)		(3)	(2)		(12)	(14)	(3)		
27	Litter bearer (657)				(8)	(8)	(16)	(1)		
28	Mechanic, automobile (014)		4	(1)			(1)			
29	Mechanic, automobile (014)		5	(1)			(1)			
30	Orderly (695)		(2)				(2)			
31	Orderly, ambulance (696)		(1)				(1)			
32	Repairman, utility (121)		(1)			(12)	(12)	(4)		
33	Technician, medical (123)		5	(2)	(2)		(4)	(3)		
34	Technician, medical (123)							(5)		
35	Technician, sanitary (196)		5	(1)	(1)		(2)	(1)		
36	Technician, sanitary (196)							(1)		
37	Technician, surgical (225)		4				(3)	(2)		
38	Technician, surgical (225)		5	(4)	(2)		(6)	(3)	(1)	
39	Technician, surgical (225)							(7)		
40	Basic (521)				(5)		(5)	(10)		
41	Total enlisted		19	13	20	26	59	137	15	
42	Aggregate		20	14	21	27	62	144	15	
43	Q Ambulance, $\frac{3}{4}$ -ton					12	12	24		
44	Q Trailer, 1-ton, 2-wheel, cargo		1					1		
45	Q Trailer, 1-ton, 2-wheel, water tank (250-gallon)		1					1		
46	Q Truck, $\frac{1}{4}$ -ton		1					1		
47	Q Truck, $\frac{3}{4}$ -ton, command and reconnaissance		1	1			1	3		
48	Q Truck, $\frac{3}{4}$ -ton weapon carrier		1					1		
49	Q Truck, $1\frac{1}{2}$ -ton, cargo		1	1			1	3		
50	Q Truck, $1\frac{1}{2}$ -ton, cargo, with winch		1					1		

Plate 8. T/O 8-87, April 1, 1942. Organization of the Collecting Troop, Medical Squadron.

Clearing Troop, Medical Squadron

Organization. The clearing troop of the medical squadron consists of 7 officers and 93 enlisted men. (See Plate 9.) It is divided for functional purposes into:

Troop headquarters.

2 clearing platoons, identical in organization, equipment and transportation.

Functions. The clearing troop is so organized that each of its platoons can establish and operate a small clearing station. In general, its functions are analogous to those of a clearing company of the medical battalion of the infantry division.

Personnel. The personnel strength of the clearing troop and its distribution are shown in Plate 9. It consists of 1 captain, 6 first lieutenants (2 of whom are dental officers), 1 first sergeant, 3 staff sergeants, 8 sergeants, 7 corporals, 7 technicians grade 4, 15 technicians grade 5, 22 privates first class and 30 privates.

Troop Headquarters. The headquarters of the clearing troop is a tactical and an administrative unit. It consists of 1 officer and 21 enlisted men. The captain, a medical officer, is the troop commander.

Functions. The functions of the clearing troop are analogous to those of the clearing company of the medical battalion.

Troop commander. The troop commander of the clearing troop is responsible for its administration and operation in accordance with the orders and policies of the medical squadron commander. He is responsible for the establishment of a clearing station or stations as the situation demands.

	1	2	3	4	5	6	7
	Unit	Technician grade	Troop headquarters	2 clearing platoons (each)	Total	Enlisted cadre	Remarks
1							
2	Captain.....		1		1		
3	Lieutenant.....		(d1) 3		6		
4	Total commissioned.....		1	3	7		4 Dental.
5	First sergeant (585).....		1		1	1	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
6	Staff sergeant, including.....		1	1	3	3	
7	Mess (824).....		(1)		(1)	(1)	
8	Platoon leader (651).....			(2)	(2)	(2)	
9	Sergeant, including.....		3	3	8	2	
10	Motor (813).....		(1)		(1)	(1)	
11	Section leader (662).....			(3)	(6)		
12	Supply (821).....		(1)		(1)	(1)	
13	Corporal, including.....		1		7	1	
14	Assistant section leader (652).....			(3)	(6)		
15	Clerk, general (405).....		(1)		(1)	(1)	
16	Technician, grade 4.....				15	3	
17	Technician, grade 5.....				22	7	
18	Private, first class.....		16	20	30	2	
19	Private.....				30		
20	Bugler (803).....		(1)		(1)		
21	Clerk, admission (055).....			(1)	(2)		
22	Cook (090).....		4	(2)	(2)	(1)	
23	Cook (090).....	5	(2)		(2)	(4)	
24	Cook's helper (521).....		(3)		(3)		
25	Chauffeur (345).....	5		(2)	(4)		
26	Chauffeur (345).....		(5)		(4)	(13)	
27	Mechanic, automobile (014).....	5	(1)		(1)		
28	Orderly (663).....		(2)		(2)		
29	Orderly, hospital (303).....			(2)	(4)		
30	Pharmacist (149).....	4		(1)	(2)	(1)	
31	Repairman, utility (121).....			(1)	(2)		
32	Technician, medical (123).....	5		(5)	(3)		
33	Technician, surgical (225).....	4		(4)	(3)	(1)	
34	Technician, surgical (225).....	5			(5)	(1)	
35	Technician, surgical (225).....			(5)	(10)		
36	Technician, surgical (225).....			(4)	(6)		
37	Basic (521).....						
38	Total enlisted.....		21	36	93	12	
39	Aggregate.....		22	39	100	12	
40	Trailer, 1-ton, 2-wheel, cargo.....		1		1		
41	Trailer, 1-ton, 2-wheel, water tank (250-gallon).....		1	1	3		
42	Truck, 1-ton.....		1		1		
43	Truck, 1-ton, command and reconnaissance.....		1		1		
44	Truck, 1-ton, weapon carrier.....		1	1	3		
45	Truck, 1½-ton, cargo.....		1	3	7		
46	Truck, 1½-ton, cargo, with winch.....		1	1	3		

Plate 9. T/O 8-88, April 1, 1942. Organization of the Clearing Troop, Medical Squadron.

Clearing platoon. There are 2 clearing platoons in the clearing troop. Each clearing platoon may be divided into:

A technical section.

A transportation section.

Each clearing platoon is capable of establishing and operating a small clearing station.

Emergency treatment and such treatment as is necessary to prepare casualties for further evacuation are provided. The duties of the commissioned and enlisted personnel are analogous to those of like personnel of the clearing platoon of the clearing company of the medical regiment. The platoon consists of 3 officers (3 first lieutenants, 1 of whom is a dental officer) and 36 enlisted men: 1 staff sergeant (platoon sergeant), 3 sergeants (section leaders), 3 corporals (assistant section leaders) 12 technicians grade 4 and technicians grade 5, and 17 privates first class or privates. The technicians grades 4 and 5, the privates first class and privates are clerks, mechanics, chauffeurs, pharmacists, medical technicians, surgical technicians, and attendants. (See Plate 9.)

Equipment, Supplies, and Transportation of the Clearing Troop. The *equipment* for a clearing troop is authorized by Tables of Basic Allowances and prescribed by the Equipment List. It consists of such equipment as is necessary for the operation of two small clearing stations. It is even more mobile than the clearing platoon of the medical regiment, yet equipment is provided for emergency surgical cases. The equipment is packed in standard containers and is similar to that of the clearing platoon of the medical regiment.

Supplies, both general and medical, are obtained through the headquarters detachment of the medical squadron.

The *transportation* of the clearing troop consists of:

- 2 trailers, $\frac{3}{4}$ -1-ton, 2 wheel, cargo
- 3 trailers, 1-ton, 2 wheel, water tank (250-gallon)
- 3 trucks, $\frac{1}{4}$ -ton, 4 x 4
- 1 truck, $\frac{3}{4}$ -ton, 4 x 4, command
- 1 truck, $\frac{3}{4}$ -ton, 4 x 4, weapons carrier
- 4 trucks, $2\frac{1}{2}$ -ton, cargo, 6 x 6
- 1 truck, $2\frac{1}{2}$ -ton, 6 x 6, cargo with winch

The Veterinary Troop, Medical Squadron

Organization. The veterinary troop of the medical squadron consists of 4 officers and 64 enlisted men. (See Plate 10.) It is divided for functional purposes into:

Troop headquarters.

Second platoon (collecting).

First platoon (collecting).

Third platoon (clearing).

Functions. The veterinary troop provides the evacuation and temporary treatment facilities for animals as does the collecting and clearing troops for men.

Personnel. The personnel strength of the veterinary troop of the medical squadron and its distribution are shown in Plate 10. It consists of 1 captain (commanding officer), 3 first lieutenants, 1 first sergeant, 4 staff sergeants, 7 sergeants, 1 corporal, 4 technicians grade 4, 9 technicians grade 5, 16 privates first class, and 22 privates.

Troop Headquarters. The headquarters of the veterinary troop is a tactical and an administrative unit. It consists of 1 veterinary officer and 14 enlisted men. A captain commands the veterinary troop. He is responsible for the administration and operation of the troop in accordance with the orders and policies of the medical squadron commander.

1st and 2d platoons (collecting). The 1st and 2d platoons are identical in organization, transportation, and equipment. They are the collecting platoons and evacuate the veterinary aid stations by means of lead lines. Each platoon consists of 1 veterinary officer and 21 enlisted men.

3d platoon (clearing). In combat the 3d platoon establishes the veterinary clearing station which provides temporary care and treatment for the animals until they can be evacuated farther to the rear. The location of the clearing station depends upon the type of operation employed by the cavalry division. The clearing platoon consists of 1 veterinary officer and 8 enlisted men. (See Plate 10.)

Transportation. The transportation of the veterinary troop of a medical squadron consists of:

- 16 animals, (4 draft, 12 riding)
- 2 trailers, 2-wheel, 2-horse, van

- 4 trucks, 4- to 5-ton, tractor, 4 x 4
 2 trucks, 1/4-ton, 4 x 4
 1 truck, 3/4-ton, 4 x 4, command
 1 truck, 2 1/2-ton, cargo, 6 x 6
 4 semi trailers, 6-ton, combination animal and cargo carrier
 1 truck, 2 1/2-ton, 6 x 6, cargo with winch

	1	2	3	4	5	6	7	8
	Unit	Technician grade	Troop head-quarters	2 collecting platoons (each)	Clearing platoon	Total	Enlisted cards	Remarks
2	Captain.....		* 1			1	1	
3	First lieutenant.....			* 1	1	3	3	
4	Total commissioned.....		1	1	1	4	4	* Mounted on horse.
5	First sergeant (585).....		1			1	1	The serial number shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
6	Staff sergeant, including.....		1	1	1	4	4	
7	Miss (824).....		(1)			1	(1)	
8	Platoon leader (651).....			(1)	(1)	2	(2)	
9	Sergeant, including.....		2	2	1	7	7	
10	Motor (814).....		(1)			(1)	(1)	
11	Section leader (652).....			(*) 1 2	(1)	3	3	
12	Supply (821).....		(1)			1	(1)	
13	Corporal, including.....							
14	Clerk, general (405).....		(1)			1	(1)	
15	Technician, grade 4.....					4	2	
16	Technician, grade 5.....					9	2	
17	Private, first class.....		9	18	6	33	16	
18	Private.....						22	
19	Clerk, general (655).....		(1)			1	1	
20	Cook (960).....		4	(1)		5	(1)	
21	Cook (960).....		5	(1)		6	(1)	
22	Cook & helper (521).....			(1)		1	(1)	
23	Chauffeur (245).....		5		(2)	7	(4)	
24	Chauffeur (345).....				(2)	2	(7)	
25	Horseholder (521).....		(*) 1	(*) 1		2	(1)	
26	Horseholder, clinical (994).....		4			4	(1)	
27	Mechanic, automobile (014).....		4	(1)		5	(1)	
28	Orderly, ambulance, veterinary (697).....				(6)	6	(12)	
29	Pharmacist, veterinary (149).....		5			5	(1)	(1)
30	Technician, medical, veterinary (250).....		5			5	(1)	(1)
31	Technician, medical, veterinary (250).....			(*) 1 2		3	(1)	(5)
32	Technician, surgical, veterinary (226).....		4			4	(1)	(1)
33	Technician, surgical, veterinary (226).....		5		(1)	6	(2)	(2)
34	Technician, surgical, veterinary (226).....				(1)	1	(1)	(3)
35	Basic (521).....			(*) 1 3		4	(5)	(5)
36	Total enlisted.....		14	21	8	64	12	
37	Aggregate.....		15	22	9	68	12	
38	Q Animal, including.....		2			2	16	
39	Horse, draft.....			(2)		2	4	
40	Horse, riding.....		(2)	(5)		7	(12)	
41	Q Semitrailer, 6-ton, combination animal and cargo carrier.....					2	4	
42	Q Trailer, 2-wheel, 2-horse van.....				1	1	2	
43	Q Trailer, 1-ton, 2-wheel, cargo.....					1	7	
44	Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....		1			1	2	
45	Q Truck, 1/4-ton.....			1		1	2	
46	Q Truck, 3/4-ton, command and reconnaissance.....		1			1	1	
47	Q Truck, 1 1/2-ton, cargo.....		2			2	4	
48	Q Truck, 4- to 5-ton, tractor.....			2		2	4	

Plate 10. T/O 8-89, April 1, 1942. Organization of the Veterinary Troop, Medical Squadron.

THE MEDICAL BATTALION, INFANTRY DIVISION, TRIANGULAR ✓

Introduction. The medical battalion is a divisional medical unit developed to furnish medical support for the infantry division. Its medical service is comparable to that of the medical regiment, with a consolidation of the battalions into a headquarters detachment and medical companies, furnishing the necessary evacuation and medical care for casualties for the division. Because of the high mobility of the division, the installations of the medical battalion must be of a more temporary nature and possess increased readiness and ability to maintain contact with the units of the division.

Functions. The functions of the medical battalion are identical to those of the medical regiment. For this reason the battalion is organized as a miniature medical regiment to maintain the best operative coordination of all the existing facilities and to give flexibility to expansion of the medical service when necessary. (See Plate 11.)

Personnel. There are within the medical battalion 34 officers and 470 enlisted men, a total strength of 504. One chaplain (first lieutenant) is attached. (See Plates 11 and 12). According to rank and grade they are as follows:

- 24 *medical officers*: 1 lieutenant colonel (commanding officer of the medical battalion), 1 major (executive and plans and training officer), 11 captains, and 11 first lieutenants.
- 8 *medical administrative corps officers*: 2 captains, 1 first lieutenant, and 5 second lieutenants (2 may be replaced by qualified warrant officers when available).
- 2 *denial officers*: 1 captain, and 1 first lieutenant.
- 470 *enlisted men*: 1 master sergeant, 5 first sergeants, 3 technical sergeants, 13 staff sergeants, 29 sergeants, 16 corporals, 15 technicians grade 4, 37 technicians grade 5, 157 privates first class, and 194 privates.

Transportation. The motor transport equipment contained in the Tables of Basic Allowances which is tabulated below takes precedence over that shown in the Tables of Organization 8-15, 8-16, 8-17, and 8-18:

	Hq & Hq Det	Coll Co (ea)	Clr Co	Total Bn
Ambulance $\frac{3}{4}$ -ton, 4 x 4 .....	..	12	..	36
Trailer, $\frac{3}{4}$ -1-ton, 2 wheel, cargo	3	2	5	14
Trailer, 1-ton, 2 wheel, water tank (250-gallon)	1	1	3	7
Truck, $\frac{1}{4}$ -ton, 4 x 4	2	1	4	9
Truck, $\frac{3}{4}$ -ton, 4 x 4, command	1	1	..	4
Truck, $\frac{3}{4}$ -ton, 4 x 4, weapon carrier	3	..	..	3
Truck, $1\frac{1}{2}$ -ton, 4 x 4, cargo .....	..	1	..	3
Truck, $1\frac{1}{2}$ -ton, 4 x 4, cargo with winch .....	..	1	..	3
Truck, $2\frac{1}{2}$ -ton, cargo, 6 x 6	4	1	6	13
Truck, $2\frac{1}{2}$ -ton, 6 x 6, cargo with winch	1	..	2	3

Battalion Headquarters. Battalion headquarters is an agency of command and consists of the commanding officer, the executive and plans and training officer (combined duty) and the adjutant, (a medical administrative corps officer). The enlisted men who are employed in the battalion headquarters are members of the headquarters and headquarters detachment. A captain of the headquarters detachment is the supply officer for the unit and the medical supply officer of the division.

Battalion Commander. The commanding officer of the medical battalion is a lieutenant colonel. His duties are analogous to those of the commanding officer of the medical regiment.

The *executive and plans and training officer* and the *adjutant* have duties analogous to those of like officers of the medical regiment.

Headquarters and Headquarters Detachment, Medical Battalion

Organization. The headquarters detachment is organized for functional purposes (see Plate 13) into:

- Battalion headquarters section.
- Personnel section.
- Detachment headquarters section.
- General and medical supply section.
- Motor maintenance section.

Functions. The headquarters and the headquarters detachment has the same functions as that of the regimental headquarters and the headquarters and service company of the medical regiment. This headquarters and headquarters detachment has as its normal functions the operation of activities necessary for the administration and maintenance of the battalion through such services as supply, mess, and clerical duty. The detachment operates the division medical distributing point.

Personnel. The distribution of the personnel of the headquarters detachment is shown in Plate 13. Exclusive of the battalion headquarters section it consists of: 1 captain, MAC, (commanding officer), 1 first lieutenant, MAC, in charge of the general and medical supply section and 2 second lieutenants, MAC, one in charge of

the personnel section and the other in charge of the motor maintenance section; and 41 enlisted men. (See Plate 13).

Battalion Headquarters Section. See Plates 12 and 13. For organization see preceding paragraph. Its functions are similar to those of the regimental headquarters section of the headquarters and service company of the medical regiment.

Detachment Headquarters Section. The functions of detachment headquarters section are similar to the company headquarters of the headquarters and service company of the medical regiment. It consists of 1 officer and 16 enlisted men.

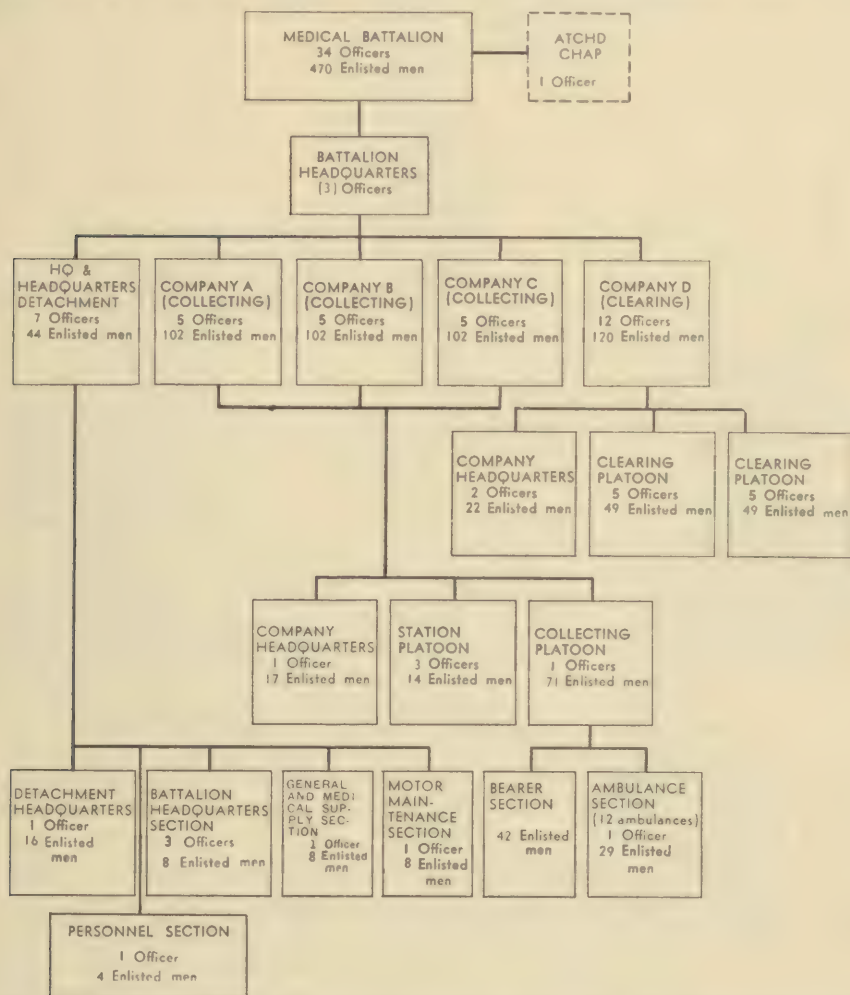


Plate 11. Suggested Functional Organization of the Medical Battalion, Infantry Division.

Personnel Section. The personnel section consists of 1 officer and 4 enlisted men. They are assisted by the company personnel clerks and handle all personnel records and the correspondence pertaining thereto for the medical battalion.

General and Medical Supply Section. The general and medical supply section consists of 1 second lieutenant, MAC (may be qualified warrant officer), and 8 enlisted men. The functions of this section are similar to that of the general and medical supply section of the headquarters and service company of the medical regiment.

Motor Maintenance Section. The motor maintenance section consists of 1 first lieu-

tenant, MAC, and 8 enlisted men. Its function is similar to that of the motor maintenance section of the headquarters and service company of the medical regiment.

The Collecting Company, Medical Battalion

Organization. There are three collecting companies in the medical battalion identical in organization, transportation, and equipment. Each is organized for functional purposes (see Plate 14), into:

Company headquarters.

A station platoon.

A collecting platoon (consisting of a litter bearer section and an ambulance section).

	1	2	3	4	5	6	7	8	9	10
1	Unit	Battalion headquarters (T/O 8-16) ^a	Headquarters and headquarters detachment (T/O 8-16) 3 collecting companies (each) (T/O 8-17)	Clearing company (T/O 8-18)	Total battalion	Attached chaplain	Aggregate	Enlisted cadre		Remarks
2	Lieutenant colonel.....	(b1)	b1			1		1		^a Battalion headquarters personnel shown in column 2 included in column 3. ^b Battalion commander. ^c Medical Administrative Corps. ^d Dental. ^e Qualified warrant officers, when available, may be used to replace these officers: 1 assistant adjutant, personnel; 1 administrative, supply, general.
3	Major.....	(1)	1			1		1		
4	Captain.....	(e1)	e2	(d1)6	14		14			
5	First lieutenant.....		e1	2	(d1)6	13	1	14		
6	Second lieutenant.....		ee2	a1		5		5		
7	Total commissioned.....	(3)	7	5	12	34	1	35		
8	Master sergeant.....		1			1		1	1	^b Battalion commander. ^c Medical Administrative Corps. ^d Dental. ^e Qualified warrant officers, when available, may be used to replace these officers: 1 assistant adjutant, personnel; 1 administrative, supply, general.
9	First sergeant.....		1	1	1	5		5	5	
10	Technical sergeant.....		3			3		3	2	
11	Staff sergeant.....		1	3	3	13		13	13	
12	Sergeant.....		5	6	6	29		29	21	
13	Corporal.....		1	4	3	16		16	6	
14	Technician, grade 4.....		4	1	8	15		15	9	
15	Technician, grade 5.....		7	5	15	37		37	14	
16	Private, first class.....		9	37	37	157		157	1	
17	Private, including.....		12	45	47	194		194		
18	Basic.....		(4)	(8)	(11)	(39)		(39)		
19	Total enlisted.....		44	102	120	470		470	72	
20	Aggregate.....	(3)	51	107	132	504	1	505	72	
21	Q Ambulance, ¾-ton.....			12		36		36		
22	Q Trailer, 1-ton, 2-wheel, cargo.....		3	2	5	14		14		
23	Q Trailer, 1-ton, 2-wheel, water tank (250-gal.).....		1	1	3	7		7		
24	Q Truck, 1½-ton.....		2	1	4	9		9		
25	Q Truck, ¾-ton, command and reconnaissance.....		1	1		4		4		
26	Q Truck, ¾-ton, weapon carrier.....		3	4		15		15		
27	Q Truck, 2½-ton, cargo.....		4		6	10		10		
28	Q Truck, 2½-ton, cargo, with winch.....			1	2	5		5		
29	Q Truck, 2½-ton, wrecker, with winch.....		1			1		1		

Plate 12. T/O 8-15, April 1, 1942. Organization of the Medical Battalion, Infantry Division.

Functions. The collecting company of the medical battalion has the same functions as the collecting company of a medical regiment. The collecting company is responsible for the collection of all casualties from aid stations of the division, the temporary treatment of these casualties, and their evacuation to the clearing station. The collecting company provides medical support for one infantry regiment. When standing operative procedures are in effect, one collecting company usually accompanies the regimental combat team.

Personnel. The distribution of the personnel of the collecting company of the medical battalion is shown in Plate 14. The personnel consists of 2 captains, 2 first lieutenants,

tenants, 1 second lieutenant, MAC, 1 first sergeant, 3 staff sergeants, 6 sergeants, 4 corporals, 1 technicians grade 4, 5 technicians grade 5, 37 privates first class and 45 privates, a total strength of 5 officers and 101 enlisted men.

1	2	3	4	5	6	7	8	9	10
Unit	Technician grade	Battalion headquarters section	Personnel section	Detachment headquarters section	General and medical supply section	Motor maintenance section	Total detachment	Enlisted cadre	Remarks
Lieutenant colonel.....	a 1						1		
Major.....	b 1						1		
Captain.....	c 1						2		
First lieutenant.....							1		
Second lieutenant.....							2		
Total commissioned.....		3	1	1	1	1	7		
Master sergeant, including.....	1						1	1	
Sergeant major (502).....	(1)						(1)	(1)	
First sergeant (585).....				1			1	1	
Technical sergeant, including.....		1			1	1	3	2	
Motor (813).....						(1)	(1)	(1)	
Personnel (816).....		(1)					(1)	(1)	
Supply (821).....					(1)		(1)		
Staff sergeant, including.....				1			1	1	
Mess (824).....				(1)			(1)	(1)	
Sergeant, including.....	1				1	1	5	2	
Message center chief (542).....	(1)						(1)		
Motor (813).....				(1)	(1)		(2)	(1)	
Supply (821).....				(1)	(1)		(2)	(1)	
Corporal, including.....							1	1	
Clerk, company (405).....				(1)			(1)	(1)	
Technician, grade 4.....							4	3	
Technician, grade 5.....							7	1	
Private, first class.....		6	3	11	6	6	43	12	
Private.....							1	1	
Bugler (803).....				(1)			(1)		
Chaplain's assistant (534).....	5	(1)					(1)		
Chauffeur (345).....	5				(1)		(1)		
Chauffeur (345).....	5			(4)	(3)	(1)	(8)		
Clerk, headquarters (055).....	4		(1)				(1)	(1)	
Clerk, headquarters (055).....	5		(1)				(1)	(1)	
Clerk, headquarters (055).....							(1)	(1)	
Clerk, receiving or shipping (186).....					(1)		(1)		
Clerk-typist (405).....	4	(1)					(1)		
Cook (060).....	5			(1)			(1)	(1)	
Cook (060).....	5			(1)			(1)		
Cook's helper (521).....				(2)			(2)		
Mechanic, automobile (014).....	4				(2)		(2)	(1)	
Mechanic, automobile (014).....	5				(2)		(3)		
Orderly (095).....		(3)					(3)		
Basic (521).....		(1)		(1)	(1)	(1)	(4)		
Total enlisted.....		8	4	16	8	8	44	13	
Aggregate.....		11	5	17	9	9	51	13	
Q Trailer, 1-ton, 2-wheel, cargo.....					3		3		
Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....				1			1	2	
Q Truck, 1-ton.....				1			1	2	
Q Truck, 3/4-ton, command and recon- naissance.....				1			1		
Q Truck, 3/4-ton, weapon carrier.....				1	1		1	3	
Q Truck, 2 1/2-ton, including crane.....				1	3	1	5		
Wrecker, with winch.....				(1)	(1)		(1)	(1)	

a Battalion commander.

b Executive officer and plans and training officer.

c Medical Administrative Corps.

d Qualified warrant officers when available, may be used to replace these officers (1 assistant adjutant, personnel; 1 administrative supply, general).

The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.

Plate 13. T/O 8-16, April 1, 1942. Organization of the Headquarters and Headquarters Detachment, Medical Battalion, Infantry Division.

The transportation of the collecting company consists of:

- 12 ambulances, 3/4-ton, 4 x 4
- 2 trailers, 3/4-1-ton, 2 wheel, cargo
- 1 trailer, 1-ton, 2 wheel, water tank (250-gallon)
- 1 truck, 1/4-ton, 4 x 4

- 1 truck, $\frac{3}{4}$ -ton, 4 x 4, command
 1 truck, $1\frac{1}{2}$ -ton, 4 x 4, cargo
 1 truck, $1\frac{1}{2}$ -ton, 4 x 4, cargo with winch
 1 truck, $2\frac{1}{2}$ -ton, cargo, 6 x 6

1	Unit	2	3	4	5 6		7	8	9
		Technician grade	Company headquarters	Station platoon	Litter bearer section	Ambulance section	Total company	Enlisted cadre	
2	Captain		1	1			2		Insert number of battalion. * Medical Adminis- trative Corps. The serial number symbol shown in pa- rentheses is an insepa- rable part of the specialist designation. A number below 500 refers to an occupa- tional specialist whose qualification analysis is found in AR 615-26. A number above 500 re- fers to a military occu- pational specialist listed in Circular No. 14, War Department, 1942.
3	First lieutenant			2			2		
4	Second lieutenant					1	1		
5	Total commissioned		1	3		1	5		
6	First sergeant (585)		1				1	1	
7	Staff sergeant, including		1	1		1	3	3	
8	Mess (824)		(1)				(1)	(1)	
9	Platoon leader (651)		(1)	(1)		(1)	(2)	(2)	
10	Sergeant, including		3	1	1	1	6	5	
11	Liaison agent (503)		(1)				(1)	(1)	
12	Motor (813)		(1)				(1)	(1)	
13	Section leader (652)		(1)	(1)	(1)	(1)	(3)	(3)	
14	Supply (821)		(1)				(1)	(1)	
15	Corporal, including		1	1	1	1	4	1	
16	Assistant section leader (652)		(1)	(1)	(1)	(1)	(3)	(1)	
17	Clerk, company (405)		(1)				(1)	(1)	
18	Technician, grade 4								
19	Technician, grade 5								
20	Private, first class		11	11	40	26	88	3	
21	Private							45	
22	Bugler (803)		(1)				(1)	(1)	
23	Chauffeur (345)	5	(1)				(1)	(1)	
24	Chauffeur (345)		(2)	(2)		(12)	(16)	(1)	
25	Cook (060)	4	(1)				(1)	(1)	
26	Cook (060)	5	(1)				(1)	(1)	
27	Cook's helper (521)		(2)				(2)	(2)	
28	Litter bearer (657)				(36)		(36)	(1)	
29	Mechanic, automobile (014)	5	(1)				(1)	(1)	
30	Orderly (695)		(1)				(1)	(1)	
31	Orderly, ambulance (696)					(12)	(12)	(1)	
32	Technician, medical (123)	5	(1)				(1)	(1)	
33	Technician, medical (123)		(2)				(2)	(2)	
34	Technician, sanitary (196)		(2)				(2)	(2)	
35	Technician, surgical (225)	5	(1)				(1)	(1)	
36	Technician, surgical (225)		(2)				(2)	(2)	
37	Basic (521)		(1)	(1)	(4)	(2)	(8)	(8)	
38	Total enlisted		17	14	42	29	102	14	
39	Aggregate		18	17	42	30	107	14	
40	Q Ambulance, $\frac{3}{4}$ -ton					12	12		
41	Q Trailer, 1-ton, 2-wheel, cargo			2			2		
42	Q Trailer, 1-ton, 2-wheel, water tank (250-gal.)		1				1		
43	Q Truck, $\frac{3}{4}$ -ton		1				1		
44	Q Truck, $\frac{3}{4}$ -ton, command and reconnaissance		1				1		
45	Q Truck, $\frac{3}{4}$ -ton, weapon carrier		2	2			4		
46	Q Truck, $2\frac{1}{2}$ -ton, cargo, with winch			1			1		

Plate 14. T/O 8-17, April 1, 1942. Organization of the Collecting Company, Medical Battalion, Infantry Division.

Company Headquarters. Company headquarters consists of 1 captain and 17 enlisted men. For distribution and functional assignment of this personnel see Plate 14. The functions of the company headquarters are similar to the functions of the company headquarters of the collecting company of the medical regiment. It is an administrative as well as a tactical agency. The personnel of company headquarters provides for the control, administration, supply and mess of the individual collecting company.

The Station Platoon. The station platoon consists of 1 captain, 2 first lieutenants (both medical officers), and 14 enlisted men. For distribution and strength of personnel see Plate 14. For functional purposes the station platoon is divided into a *liaison section* and the *collecting station section*. The functions of these sections are similar to those of similar sections of a collecting company of the medical regiment.

The Collecting Platoon. The collecting platoon consists of 1 officer, a second lieutenant Medical Administrative Corps and 71 enlisted men. The functions of the collecting platoon are similar to the like sections of a collecting company of the medical regiment. For functional purposes the collecting platoon has been divided into a litter bearer section and an ambulance section.

	1	2	3	4	5	6	7
	Unit	Technician grade	Company head-quarters	2 clearing platoons (each)	Total company	Enlisted cadre	Remarks
2	Captain.....		1	5	{ ^(d1) 6 (^{d1})6	-----	
3	First lieutenant.....		1			-----	
4	Total commissioned.....		2	5	12	-----	Drives vehicle in addition to other duties.
5	First sergeant (585).....		1		1	1	^d Dental.
6	Staff sergeant, including.....		1	1	3	3	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to a occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 11, War Department, 1942.
7	Mess (821).....		(1)	(1)	(1)	(1)	
8	Platoon leader (651).....		(1)	(1)	(2)	(1)	
9	Sergeant, including.....		2	2	6	4	
10	Motor (813).....		(1)	(1)	(1)	(1)	
11	Section leader (652).....		(1)	(2)	(4)	(2)	
12	Supply (821).....		(1)	(1)	(1)	(1)	
13	Corporal, including.....		1		3	2	
14	Clerk, admission (055).....		(1)	(1)	(2)	(1)	
15	Clerk, company (405).....		(1)		(1)	(1)	
16	Technician, grade 4.....				3	3	
17	Technician, grade 5.....				15	4	
18	Private, first class.....		17	45	37	-----	
19	Private.....				47	-----	
20	Buzler (803).....		(1)		(1)	-----	
21	Chauffeur (345).....	5		(1)	(2)	-----	
22	Chauffeur (345).....		(3)	(3)	(9)	-----	
23	Cook (060).....	4	(3)		(3)	(1)	
24	Cook (060).....	5	(3)		(3)	(1)	
25	Cook's helper (521).....		(1)		(2)	-----	
26	Mechanic, automobile (014).....	4	(1)		(1)	-----	
27	Orderly (695).....		(2)		(2)	-----	
28	Pharmacist (149).....	4		(1)	(2)	(1)	
29	Technician, dental (067).....	5		(1)	(2)	(1)	
30	Technician, medical (123).....	5		(2)	(4)	(1)	
31	Technician, medical (123).....			(4)	(8)	-----	
32	Technician, sanitary (196).....			(2)	(4)	-----	
33	Technician, surgical (225).....	4		(1)	(2)	(1)	
34	Technician, surgical (225).....	5		(2)	(4)	(1)	
35	Technician, surgical (225).....			(5)	(10)	-----	
36	Ward attendant, medical (303).....			(9)	(18)	-----	
37	Ward attendant, surgical (303).....			(9)	(18)	-----	
38	Basic (521).....		(1)	(5)	(11)	-----	
39	Total enlisted.....		22	49	120	17	
40	Aggregate.....		24	54	132	17	
41	Q Trailer, 1-ton, 2-wheel, cargo.....		1	2	5	-----	
42	Q Trailer, 1-ton, 2-wheel, water tank (250-gal.).....		1	1	3	-----	
43	Q Truck, 1/4 ton.....		2	1	4	-----	
44	Q Truck, 2 1/4 ton, cargo.....		2	2	6	-----	
45	Q Truck, 2 1/4 ton cargo, with winch.....			1	2	-----	

Plate 15. T/O 8-18, April 1, 1942. Organization of the Clearing Company, Medical Battalion, Infantry Division.

The *litter bearer section* consists of 1 sergeant, 1 corporal, and 40 privates first class or privates (36 litter bearers, 4 basics), a total strength of 42 enlisted men. No transportation is provided as an organic part of the litter bearer section. The functions of

the bearer section are similar to those of the litter bearer section of a collecting company of the medical regiment. The litter bearer section may be subdivided into two subsections providing 4 litter squads in each. A noncommissioned officer is placed in charge of each subsection.

The *ambulance section* consists of 1 second lieutenant (MAC), 1 staff sergeant, sergeant, 1 corporal, and 26 privates first class or privates, 24 drivers, and 2 basics, total strength of 1 officer and 29 enlisted men. The ambulance section operates 12 ambulances which are its organic transportation. The ambulance section may be divided into two subsections of six ambulances each, a noncommissioned officer in charge of each. The functions of the ambulance section are similar to those of the ambulance section of the medical regiment.

The Clearing Company, Medical Battalion

Organization. The clearing company of the medical battalion is organized for functional purposes (See Plate 15) into:

Company headquarters.

2 clearing platoons identical in organization, transportation, and equipment.

Functions. The clearing company of the medical battalion has the same functions as a clearing company of the medical regiment. The company operates clearing stations as necessary for the sorting and treatment of patients evacuated by the collecting companies. Patients are prepared at these clearing stations for further evacuation to the rear by corps when corps is operating independently or army medical service.

Personnel. The distribution of the personnel of the clearing company is shown in Plate 15. It consists of 6 captains, 6 first lieutenants (one officer in each grade is dental officer), 1 first sergeant, 3 staff sergeants, 6 sergeants, 3 corporals, 8 technicians grade 4, 15 technicians grade 5, 37 privates first class, and 47 privates, a total strength of 12 officers and 120 enlisted men.

Company Headquarters. Company headquarters consists of 1 captain, 1 first lieutenant, and 22 enlisted men. For grade and distribution of enlisted personnel see Plate 15. The functions of company headquarters are similar to the functions of the company headquarters of a clearing company of the medical regiment. It is an administrative as well as a tactical agency.

The Clearing Platoons. There are two platoons in the clearing company, identical in organization, transportation, and equipment. Each platoon consists of 5 officers, 1 first lieutenant (dental officer), 1 staff sergeant, 2 sergeants, 1 corporal, 2 technicians grade 4 (1 pharmacist, and 1 surgical technician), 7 technicians grade 5 (2 light truck drivers, 1 dental technician, 2 medical technicians, 2 surgical technicians), and 40 privates first class or privates, a total strength of 5 officers and 53 enlisted men. (See Plate 15.) Each clearing platoon is capable of operating a clearing station, so that it may operate at considerable distances from company headquarters. For command, administration, function, and training, the clearing platoon may be further subdivided into two sections, a *technical section* and a *transportation section*. The functions of the clearing platoon are similar to those of a clearing platoon of the medical regiment.

THE ARMORED MEDICAL BATTALION

Organization. The armored medical battalion (T/O 8-75) is composed of the battalion headquarters and headquarters company, and three armored medical companies identical in organization, equipment and transportation. See Plates 16 and 17.

Headquarters and Headquarters Company. The headquarters and headquarters company of the Armored Medical Battalion consists of the battalion headquarters and the headquarters company. The battalion headquarters is further subdivided into a headquarters section and a personnel section. The headquarters company is further subdivided into a company headquarters, a battalion supply section, a division medical supply section, a battalion maintenance section, and a transportation platoon.

Battalion headquarters. The battalion headquarters consists of 6 officers (the battalion commander, his staff, the personnel officer), 2 warrant officers and 20 enlisted men.

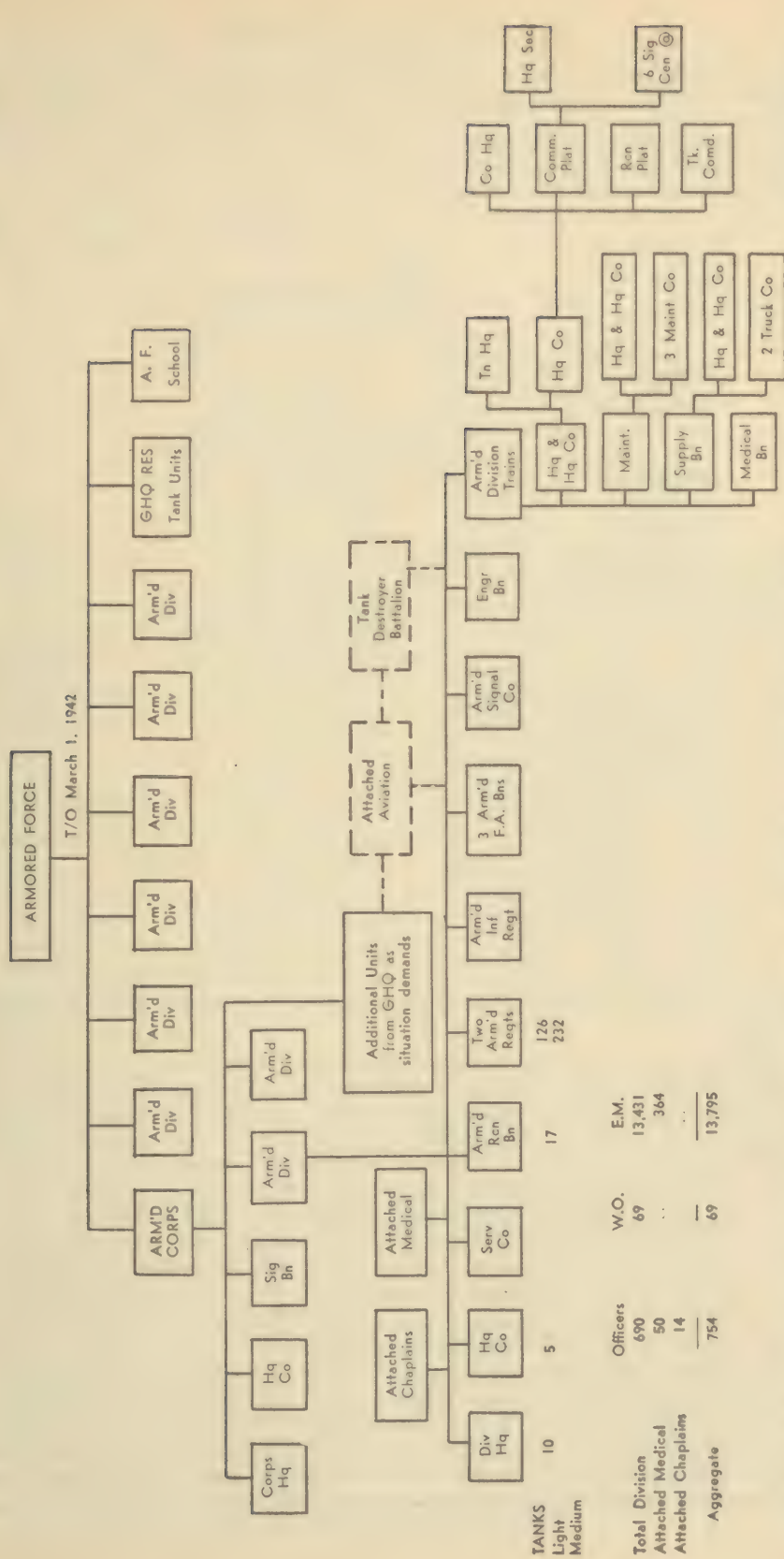


Plate 16. Functional Organization of the Armored Force to Show Relationship of Attached Medical Personnel and Armored Medical Battalion.

Battalion headquarters is divided into a *headquarters section* and a *personnel section*. There are 5 officers, 1 warrant officer, and 12 enlisted men in the headquarters section. The personnel section consists of 1 officer (second lieutenant, MAC) and 1 technical sergeant (sergeant major), 3 sergeants (morning report 368, payroll 368, and service record 368), 3 technicians grade 5, and 1 private first class or private.

	1	2	3	4	5	6
1	Unit	Battalion headquarters and headquarters company (T/O 8-76)	3 medical companies (T/O 8-77) (each)	Total battalion	Enlisted cadre	Remarks
2	Lieutenant colonel.....	1		1		
3	Major.....	1		1		
4	Captain.....	3	3	12		
5	First lieutenant.....	2	7	23		
6	Second lieutenant.....	3	1	6		
7	Total commissioned.....	10	11	43		
8	Warrant officer.....	3		3		
9	Master sergeant.....	3		3	3	
10	First sergeant.....	1		1	4	
11	Technical sergeant.....	3		3	6	
12	Staff sergeant.....	2	10	32	26	
13	Sergeant.....	12	4	24	15	
14	Corporal.....	1	6	19	10	
15	Technician, grade 4.....	7	3	16	8	
16	Technician, grade 5.....	20	11	53	4	
17	Private, first class.....	18	39	135		
18	Private.....	23	47	164		
19	Basic.....	(6)	(8)	(30)		
20	Total enlisted.....	90	122	456	75	
21	Aggregate.....	103	133	502	75	
22	O Car, half-track, M3, without armament.....		1	3		
23	O Truck, 10-ton, wrecker.....	1		1		
24	Q Ambulance, cross country.....		12	36		
25	Q Car, light, 5-passenger sedan.....			1		
26	Q Motorcycle, solo.....	2		2		
27	Q Trailer, water, 250-gallon.....	1	2	7		
28	Q Truck, ¼-ton.....	3	5	18		
29	Q Truck, ¾-ton, carry-all, with 12-volt ignition.....	4		16		
30	Q Truck, ¾-ton, command.....		1	1		
31	Q Truck, 2½-ton, including.....	15	10	45		
32	Bus or panel body.....		(1)	(3)		
33	Cargo.....	(1)	(2)	(6)		
34	Equipment.....	(1)	(1)	(4)		
35	Fuel, lubricants.....	(5)		(5)		
36	Kitchen.....	(1)	(1)	(4)		
37	Maintenance wrecker, with winch.....	(3)	(1)	(6)		
38	Medical supply.....	(2)		(2)		
39	Operating room body.....		(2)	(6)		
40	Personnel.....	(1)		(1)		
41	Personnel, with litter inserts.....		(2)	(6)		
42	Rations.....	(1)		(1)		
43	Supply.....	(1)		(1)		
44	S Radio set.....	4	4	16		

Plate 17. T/O 8-75, March 1, 1942. Organization of the Armored Medical Battalion.

Headquarters Company. The headquarters company consists of 4 officers, 1 warrant officer, and 70 enlisted men: 1 captain, 1 first lieutenant, 2 second lieutenants, 1 warrant officer, 2 master sergeants (1 maintenance sergeant, mounted in ¼-ton truck, and 1 supply sergeant, chief of division medical supply section), 1 first sergeant, 2 technical sergeants (supply), 2 staff sergeants (1 maintenance and 1 mess), 8 sergeants (1 maintenance crew chief, 2 section leaders, 5 supply), 1 corporal (clerk), 6 technicians grade 4 (1 cook, 1 automobile electrician, 3 automobile mechanics, and 1 welder), 15 technicians grade 5 (4 2½-ton truck drivers, 1 10-ton wrecker truck driver, 4 automobile mechanics, 3 clerks, 2 cooks, and 1 painter), and 33 privates first class or privates (3 cargo handlers, 14 2½-ton truck drivers, 2 chauffeurs, 1 stock clerk, 3 cooks' helpers, 3 orderlies, 1 radio tender, and 6 basics). The headquarters company performs the same functions as the headquarters and service company of the medical regiment.

Company headquarters. The company headquarters consists of the command section, the maintenance section and the administrative, supply, and mess section. The *command section* consists of 1 officer (a captain) and 2 enlisted men (a chauffeur and a radio tender). The *maintenance section* consists of 1 staff sergeant (maintenance chief of section) 1 technician grade 4 (mechanic) 1 technician grade 5 (mechanic), and 3 private first class or privates, (one 2½-ton truck driver, and two basics). The *admin-*

istrative supply and mess section consists of 1 first sergeant, 1 staff sergeant (mess), 1 sergeant (supply), 1 corporal (clerk), 1 technician grade 4 (cook), 2 technicians grade 5 (cooks), 8 privates first class or privates (2 chauffeurs 2½-ton truck drivers, 3 cooks' helpers and 3 orderlies). The transportation for the company headquarters consists of one water tank trailer (250-gallon), one ¼-ton truck and one ¾-ton carry-all truck, with 12-volt ignition and radio set, three 2½-ton trucks (1 for equipment, 1 for kitchen, 1 maintenance wrecker with winch).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Unit	Technician grade	Headquarters section	Personnel section	Company headquarters	Maintenance section	Administrative, supply and mess section	Battalion supply section	Division medical supply section	Battalion maintenance	Platoon headquarters	Fuel and lubricants section	Ration section	Total company	Aggregate	Enlisted cadre	Remarks
Lieutenant colonel		4 1												1		
Major		4 1											1	3		* 1st echelon maintenance of company vehicles.
Captain		4 1		1									1	3		* Additional mess personnel for battalion headquarters mess.
First lieutenant		4 1											1	3		* Contains 2 "crews," each with 2½-ton truck available for rendering assistance of the battalion as required.
Second lieutenant			4 1										1	3		* Battalion commander.
Total commissioned		5	1	1			1		1	1			4	10		* Executive officer or second in command.
Warrant officer		4 1	4 1										1	3		* Operations officer or S-3, or operations non-commissioned officer.
Master sergeant, including Maintenance (337)			1						1	1			2	3	3	* Medical Administrative Corps.
Sergeant major (502)			(1)						(1)				(1)	(1)	(1)	* Adjutant or S-1.
Supply (326)													(1)	(1)	(1)	* Intelligence officer or S-2.
First sergeant (386)							1						1	1	1	* Chief of platoon, section, crew, etc.
Technical sergeant, including Sergeant major, personnel (816)			(1)					1	(1)				2	3	2	* Supply officer.
Staff sergeant, including Maintenance (337)								(1)	(1)				(1)	(1)	(1)	* Specially selected quartermaster officer.
Mess (324)													(1)	(1)	(1)	* Maintenance officer.
Sergeant, including Communication (342)			(1)	3		(1)	1	1	2	2		1	8	12	9	* Mounted in ¼-ton truck.
Crew chief (337)										(1)			(1)	(1)	(1)	* Assistant operations officer, signal communication.
Morning report (368)			(1)							(1)			(1)	(1)	(1)	* Assistant adjutant, clerical.
Pay roll (368)			(1)										(1)	(1)	(1)	* Assistant supply officer.
Section leader (362)			(1)										(1)	(1)	(1)	* Mounted on motorcycle.
Service records (368)			(1)										(1)	(1)	(1)	* Driven by crew member or passenger.
Supply (321)										(1)			(1)	(1)	(1)	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 815-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
Cook (352)										(1)			(1)	(1)	(1)	
Cook (352)										(1)			(1)	(1)	(1)	
Cook, mail (352)										(1)			(1)	(1)	(1)	
Clerk, officers record section (405)													(1)	(1)	(1)	
Clerk, stock (324)										(1)			(1)	(1)	(1)	
Cook (360)										(1)			(1)	(1)	(1)	
Cook (360)										(1)			(1)	(1)	(1)	
Cook's helper (521)										(1)			(1)	(1)	(1)	
Draftsman (326)			(1)							(1)			(1)	(1)	(1)	
Electrician, automobile (912)										(1)			(1)	(1)	(1)	
Mechanic (314)										(1)			(1)	(1)	(1)	
Mechanic (314)										(1)			(1)	(1)	(1)	
Orderly (366)										(1)			(1)	(1)	(1)	
Painter (343)										(1)			(1)	(1)	(1)	
Radio tender (776)			(2)		(1)					(1)			(1)	(1)	(1)	
Welder (256)										(1)			(1)	(1)	(1)	
Basic (321)							(2)	(2)				(2)	(2)	(2)	(2)	
Total enlisted		12	8	2	6	15	6	12	14	10	5	70	90	24		
Aggregate		18	10	3	6	15	8	12	15	1	10	5	75	103	24	
Truck, 10-ton, wrecker										1			1	1	1	
Car, light, 5-passenger sedan													1	1	1	
Motorcycle, solo			2										1	1	1	
Trailer, water, 20-gal													1	1	1	
Truck, ¼-ton										1	1		3	3	3	
Truck, ¾-ton carry-all with 12-volt ignition			(1) 3		1								1	4	1	
Truck, ¾-ton, command													1	1	1	
Truck, 2½-ton, including Equipment				1			1	2	1	2		5	14	15		
Fuel, lubricants							(1)						(1)	(1)	(1)	
Kitchen							(1)						(1)	(1)	(1)	
Maintenance wrecker, with winch							(1)			(2)			(3)	(3)	(3)	
Medical supply								(2)					(2)	(2)	(2)	
Personnel				(1)									(1)	(1)	(1)	
Rations												(1)	(1)	(1)	(1)	
Supply								(1)					(1)	(1)	(1)	
Radio set			3		1								1	4		

Plate 18. T/O 8-76, March 1, 1942. Organization of Headquarters and Headquarters Company, Armored Medical Battalion.

Battalion supply section. The battalion supply section consists of 1 second lieutenant (supply officer, chief of section), 1 warrant officer (assistant supply officer), 1 technical sergeant, 1 sergeant (supply), 1 technician grade 5 (clerk), and 3 privates first class or privates one 2½-ton truck driver, and 2 basics).

Division medical supply section. The division medical supply section consists of 12 enlisted men: 1 master sergeant (supply sergeant, chief of section), 1 technical sergeant (supply), 2 sergeants (supply), 2 technicians grade 5 (clerks), and 6 privates first class or privates (2 cargo handlers, 1 chauffeur, 2 2½-ton truck drivers, and 1 stock clerk). The transportation for the division medical supply section consists of one 3/4-ton command truck, two 2½-ton cargo trucks.

Battalion maintenance section. The battalion maintenance section contains two "crews" each with a 2½-ton truck available for reinforcement of the battalion as required. The battalion maintenance section consists of 1 second lieutenant who is an especially selected quartermaster officer (maintenance officer, mounted in a 1/4-ton truck), 1 master sergeant (maintenance, mounted in 1/4-ton truck), 2 sergeants (1 a crew chief and the other a supply sergeant), 3 technicians grade 4 (1 automobile electrician, 2 mechanics, and 1 welder), 5 technicians grade 5 (1 10-ton wrecker truck driver, 3 mechanics, and 1 painter), and 2 privates first class or privates (two 2½-ton truck chauffeurs). The transportation of the battalion maintenance section consists of one 10-ton wrecker truck, one ¼-ton truck (driven by crew member), and two 2½-ton maintenance wrecker trucks, with winch.

Transportation platoon. The transportation platoon consists of 1 first lieutenant, MAC, 2 sergeants (section leaders) and 2 technicians grade 5 (2½-ton truck drivers), and 11 privates first class or privates (1 cargo handler, 8 2½-ton truck chauffeurs and 2 basics). Transportation consists of one ¼-ton truck and six 2½-ton trucks. The transportation platoon is subdivided into a *platoon headquarters* (1 officer, first lieutenant, MAC), a *fuel and lubricant section* (1 sergeant (section leader), and 9 2½-ton truck chauffeurs), and a *ration section* (1 sergeant (section leader), 1 chauffeur (2½-ton truck), 1 private first class or private (cargo handler) and 2 basics).

Medical Company. There are 3 medical companies identical in organization, equipment, and transportation in the armored medical battalion. See Plate 19. The armored medical company consists of a company headquarters, a litter platoon, an ambulance platoon and a treatment platoon. Each armored medical company performs functions similar to that of a collecting company of the medical battalion for the area which it serves. There is provided a collecting, an ambulance (evacuation), and a treatment service.

Company headquarters. Company headquarters consists of a command section; an administrative, supply, and mess section; and a maintenance section.

The *command section* consists of 1 captain (company commander), 1 first lieutenant, MAC (maintenance officer and company administrative officer), 1 communications sergeant, and 2 privates first class or privates (1 chauffeur and 1 radio tender). The transportation and equipment of the command section consists of one 3/4-ton carry-all truck with 12-volt ignition.

The *administrative, supply, and mess section* consists of 14 enlisted men: 1 first sergeant, 1 staff sergeant (mess sergeant), 3 sergeants (1 clerk and 2 supply sergeants), 1 corporal (clerk), 1 technician grade 4 (cook), 3 technicians grade 5 (2 cooks, 1 2½-ton truck driver), and 4 privates first class or privates (1 2½-ton truck chauffeur, and 3 cooks' helpers).

The transportation consists of two 2½-ton trucks for the kitchen and section equipment and one ¼-ton truck.

The *maintenance section* consists of 7 enlisted men: 1 staff sergeant (maintenance), 1 technician grade 4 (mechanic), 1 technician grade 5 (2½-ton truck chauffeur) and 4 privates first class or privates (a chauffeur, a mechanic, and 2 basics). This section performs first and second echelon motor maintenance for the vehicles of the company. The maintenance section transportation consists of one 1/4-ton truck and a 2½-ton truck, a maintenance wrecker with winch.

The *litter platoon.* The litter platoon consists of 1 officer (first lieutenant, MAC)

and 33 enlisted men: 1 staff sergeant (platoon sergeant), 2 corporals (section leader assistants) 1 technician grade 5 (half-track driver), and 29 privates first class or privates (2 chauffeurs, 1 2½-ton truck driver, 24 litter bearers and 2 basics). *Transportation* of the litter platoon consists of 1 half-track M3 car without armament, one 1/4-ton truck, one 3/4-ton carry-all truck with 12-volt ignition, one 2½-ton truck (personnel with litter inserts and a radio set).

	1	2	3	4	5	6	7	8	9	10	11	12	13
			Company headquarters					Treatment platoon					
	Unit	Technician grade	Command section	Administrative, supply, and mess section	Maintenance section	Litter platoon	Ambulance platoon	Platoon headquarters	Operating section	Casualty treatment section	Total company	Enlisted cadre	Remarks
2	Captain.....		1						2		3		
3	First lieutenant.....		(a + 1)			(e 1)		1	(4) 3	1	7		
4	Second lieutenant.....						(e 1)				1		
5	Total commissioned.....		2			1	1	1	5	1	11		* Maintenance officer. * Company administrative officer. * Medical Administrative Corps. * Driven by crew member or passenger.
6	First sergeant (585).....			1						1	1	1	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
7	Technical sergeant, including.....								1	(1)	1		
8	Surgical (225).....									(1)	1		
9	Staff sergeant, including.....			1	1	1	1	1	3	2	10		
10	Maintenance (337).....				(1)						(1)		
11	Mess (824).....										(1)		
12	Platoon sergeant (651).....					(1)	(1)	(1)			(1)		
13	Section leader (652).....									(1)	(1)		
14	Surgical (225).....								(3)	(1)	(4)		
15	Sergeant, including.....		1	3							4	2	
16	Clerk (055).....			(1)							(1)		
17	Communication (542).....		(1)								(1)		
18	Supply (821).....			(2)							(2)		
19	Corporal, including.....					2	2			1	6	3	
20	Clerk (405).....			(1)							(1)		
21	Section leader assistant (652).....					(2)	(2)				(4)	(2)	
22	Technician, surgical (225).....									(1)	(1)		
23	Technician, grade 4.....										3		
24	Technician, grade 5.....		2	8	6	30	20	1	14	10	11	1	
25	Private, first class.....										39		
26	Private.....										39		
27	Chauffeur (345).....		(1)		(1)	(2)	(27)	(1)			(32)		
28	Chauffeur, 2½-ton truck (345).....	5			(2)	(1)	(1)		(4)	(2)	(2)		
29	Chauffeur, 2½-ton truck (345).....				(2)						(8)		
30	Cook (960).....	4			(1)						(1)		
31	Cook (960).....	5			(2)						(2)		
32	Cook's helper (621).....				(3)						(3)		
33	Driver, half-track (735).....	5				(1)	(24)				(1)		
34	Litter bearer (657).....										(24)		
35	Mechanic (011).....	4			(1)						(1)		
36	Mechanic (011).....				(1)						(1)		
37	Radio tender (776).....	5		(1)							(1)		
38	Technician, dental (067).....	5							(1)	(1)	(1)		
39	Technician, medical (123).....	5							(1)	(2)	(3)	(1)	
40	Technician, medical (123).....								(1)	(4)	(5)		
41	Technician, surgical (225).....	4							(1)	(1)	(1)		
42	Technician, surgical (225).....	5							(2)	(2)	(2)		
43	Technician, surgical (225).....								(4)	(4)	(4)		
44	Basic (521).....				(2)	(2)	(2)			(2)	(8)		
45	Total enlisted.....		3	14	7	33	32	2	18	13	122	17	
46	Aggregate.....		5	14	7	34	33	3	23	14	133	17	
47	O Car, half-track M3, without armament.....					1					1		
48	Q Ambulance, cross country.....						12				12		
49	Q Trailer, water, 250-gallon.....								1	1	2		
50	Q Truck, ¼-ton.....				(e 1)	1	1	2			5		
51	Q Truck, ¾-ton, carry-all, with 12-volt ignition.....	1				1	1	1			4		
52	Q Truck, 2½-ton, including.....		2	1		1			4	2	10		
53	Bus or panel body.....								(1)		(1)		
54	Cargo.....								(2)		(2)		
55	Equipment.....			(1)							(1)		
56	Kitchen.....			(1)							(1)		
57	Maintenance wrecker, with winch.....				(1)						(1)		
58	Operating room body.....								(1)	(1)	(2)		
59	Personnel, with litter inserts.....					(1)				(1)	(2)		
60	S Radio set.....		1				1	1			4		

Plate 19. T/O 8-77, March 1, 1942. Armored Medical Company.

The ambulance platoon. The ambulance platoon provides the ambulance service for evacuation of casualties. It is commanded by a second lieutenant, MAC. The enlisted personnel consists of 1 staff sergeant (platoon sergeant), 2 corporals (section leader assistants), 29 privates first class or privates (27 chauffeurs and 2 basics). *Transportation* of the ambulance platoon consists of 12 cross-country ambulances, two ¼-ton trucks, one ¾-ton carry-all with 12-volt ignition and radio set.

Treatment platoon. The treatment platoon is organized into a platoon headquarters and operating section and a casualty treatment section. The total strength is 7 officers and 33 enlisted men.

The platoon headquarters consists of 1 first lieutenant (medical officer) 1 staff sergeant (platoon sergeant), and 1 private first class or private (chauffeur), a total strength of 1 officer and 2 enlisted men. *Transportation* of platoon headquarters consists of one 3/4-ton carry-all truck with 12-volt ignition and radio set.

The *operating section* consists of 2 captains (medical officers), 2 first lieutenants (medical officers) and 1 first lieutenant (dental officer), 1 technical sergeant (surgical), 3 staff sergeants (surgical), 1 technician grade 4 (surgical technician), 4 technicians grade 5 (1 dental technician, 1 medical technician, and 2 surgical technicians), and 9 privates first class or privates (4 chauffeurs, 1 medical technician, and 4 surgical technicians), a total strength of 5 officers and 18 enlisted men. *Transportation* consists of 1 trailer, (250-gallon water tank), and four 2½-ton trucks (1 a truck with bus or panel body, 1 a truck with an operating room body, and 2 cargo trucks).

The *casualty treatment section* consists of 1 first lieutenant (medical officer), 2 staff sergeants (1 a section leader, the other a surgical technician), 1 corporal, 2 technicians grade 5 (medical technician), and 8 privates first class or privates (2 2½-ton truck chauffeurs, 4 medical technicians, and 2 basics), a total strength of 1 officer and 13 enlisted men. *Transportation* of the casualty treatment section consists of one 250-gallon water tank trailer, two ½-ton trucks (1 with operating room body and the other equipped with litter inserts.)

MEDICAL BATTALION MOUNTAIN DIVISION

Organization. The Mountain Medical Battalion (T/O 8-135) furnishes medical support for the mountain division in a manner similar to that which a medical squadron furnishes for the cavalry division. It is organized into a battalion headquarters, a headquarters detachment, three collecting companies identical in organization, equipment, and transportation, a clearing company, and a veterinary company. The personnel consists of 47 officers and 543 enlisted men, an aggregate strength of 590.

	1	2	3	4	5	6	7	8	9
	Unit	Battalion headquarters (T/O 8-135) *	Headquarters detachment (T/O 8-135)	3 collecting companies (each) (T/O 8-137)	Clearing company (T/O 8-135)	Veterinary company (T/O 8-135)	Total battalion (battalion headquarters, headquarters detachment, 3 collecting companies, 1 clearing company, and 1 veterinary company)	Enlisted cadre	Remarks
2	Lieutenant colonel.....	(1)	1	---	---	---	1	---	* Personnel shown in column 2 is included in column 3. Personnel in column 2 includes— 1 lieutenant colonel, Medical Corps, commanding officer. 1 major, Medical Corps, executive officer. 1 captain, Medical Corps, planning and training officer. 1 captain, chaplain.
3	Major.....	(1)	1	---	---	---	1	---	
4	Captain.....	(2)	(b1) 3	1	4	1	11	---	
5	Lieutenant.....	(2)	4	(4) 10	8	---	34	---	
6	Total commissioned.....	(6)	9	5	14	9	47	---	
7	Master sergeant.....	---	1	---	---	---	1	1	1 lieutenant colonel, Medical Corps, commanding officer. 1 major, Medical Corps, executive officer. 1 captain, Medical Corps, planning and training officer. 1 captain, chaplain. 1 lieutenant, Medical Administrative Corps, adjutant. 1 lieutenant, Medical Administrative Corps, personnel officer. b May be Medical Administrative Corps. c Chaplain. d Dental.
8	First sergeant.....	---	1	1	1	1	6	6	
9	Technical sergeant.....	---	2	---	---	---	2	1	
10	Staff sergeant.....	---	2	3	5	5	21	4	
11	Sergeant.....	---	6	7	4	16	46	8	
12	Corporal.....	---	1	5	7	10	33	5	
13	Technician, grade 4.....	---	2	2	10	2	20	7	
14	Technician, grade 5.....	---	9	13	19	16	83	11	
15	Private, first class.....	---	8	20	40	33	141	15	
16	Private, including.....	---	(1) 27	---	61	47	190	---	
17	Basic.....	---	(4)	(7)	(12)	(13)	(50)	---	
18	Total enlisted.....	---	43	78	137	129	543	58	
19	Aggregate.....	(6)	52	83	151	138	590	58	
20	Q Ambulance, ¾-ton.....	---	---	15	---	---	15	---	
21	Q Animal.....	---	---	25	---	45	120	---	
22	Q Trailer, 2-wheel, 2-horse van.....	---	---	---	---	8	3	---	
23	Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....	---	---	1	---	4	1	6	
24	Q Truck, ¼-ton.....	---	3	---	---	4	7	---	
25	Q Truck, ¾-ton, command and reconnaissance.....	---	1	---	4	1	6	---	
26	Q Truck, ¾-ton, weapon carrier.....	---	2	---	1	---	3	---	
27	Q Truck, 2½-ton, cargo.....	---	6	---	9	---	15	---	
28	Q Truck, 2½-ton, cargo, with winch.....	---	1	---	3	4	3	---	
29	Q Truck, 4-5-ton, tractor.....	---	---	---	---	3	3	---	
30	Q Wagon, escort.....	---	---	1	---	---	3	---	

Plate 20. T/O 8-135, April 1, 1942. Organization of the Medical Battalion, Mountain Division.

Headquarters Detachment. The headquarters detachment performs similar functions to those of the headquarters detachment of the medical squadron. There are 9 officers and 43 enlisted men in the headquarters detachment. It is organized into a battalion headquarters and a headquarters detachment.

Battalion Headquarters. The battalion headquarters consists of a personnel section and an administrative section.

The *personnel section* consists of 1 lieutenant, MAC (a qualified warrant officer may replace this officer), 1 technical sergeant (personnel), 3 sergeants (record clerks; 1 qualified in pay roll procedure, 1 qualified in service record procedure, and 1 qualified in morning report procedure), and 1 private first class or private (general clerk).

	1	2	3	4	5	6	7	8	9	10
	Unit	Technician grade	Personnel section	Administrative section	Headquarters	General and medical supply section	Motor maintenance section	Total	Enlisted cadre	Remarks
1										
2	Lieutenant colonel			a 1				1		
3	Major			1				1		
4	Captain			(b) 2				3		
5	Lieutenant			a 1		a 1	c 1	4		
6	Total commissioned		1	5	1	1	1	9		* Battalion commander.
7	Master sergeant, including			1				1	1	* Chaplain.
8	Sergeant major (302)			(1)				(1)	(1)	* May be Medical Administrative Corps.
9	First sergeant (585)			1				1	1	* Warrant officer
10	Technical sergeant, including			1		1		2	1	* 1 qualified in pay roll procedure; 1 qualified in service record procedure; 1 qualified in morning report procedure.
11	Personnel (516)			(1)				(1)	(1)	
12	Supply (825)					(1)		(1)	(1)	
13	Staff sergeant, including			1		1		2	1	
14	Mess and supply (824)			(1)				(1)	(1)	
15	Motor (813)					(1)		(1)	(1)	
16	Sergeant, including		3		1	2		6		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AF 615-25. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 57, War Department, 1942.
17	Clerk, record (405)		(3)		(1)			(3)	(1)	
18	Motor (813)				(1)			(1)	(1)	
19	Supply (825)				(2)			(2)	(2)	
20	Corporal, including				1			1	1	
21	Clerk, company (056)				(1)			(1)	(1)	
22	Technician, grade 4							2	2	
23	Technician, grade 3							9	9	
24	Private, first class		1	10	7	8	4	28	28	
25	Private							11	11	
26	Chaplain's assistant (534)	5		(1)				(1)	(1)	
27	Clerk, general (055)		(1)			(2)		(3)	(3)	
28	Clerk, stock (324)	5				(1)		(1)	(1)	
29	Cook (060)				(1)			(1)	(1)	
30	Cook (060)	5			(1)			(1)	(1)	
31	Cook's helper (521)				(2)			(2)	(2)	
32	Driver, light truck (316)	5		(1)		(3)		(4)	(4)	
33	Driver, light truck (319)			(4)	(1)	(3)		(8)	(8)	
34	Mechanic, automobile (014)	4				(1)		(1)	(1)	
35	Mechanic, automobile (014)	5				(1)	(2)	(3)	(3)	
36	Orderly (065)			(2)				(2)	(2)	
37	Stenographer (213)	5		(1)				(1)	(1)	
38	Basic (321)			(1)	(1)	(1)	(1)	(4)	(4)	
39	Total enlisted		5	11	11	11	5	43	7	
40	Aggregate		6	16	12	12	6	52	7	
41	Trailer, 1-ton, 2-wheel, water tank (250-gallon)					1		1	1	
42	Truck, 1/4-ton			3				3	3	
43	Truck, 3/4-ton, command and reconnaissance			1				1	1	
44	Truck, 1/2-ton, weapon carrier					1	1	2	2	
45	Truck, 2 1/2-ton, cargo			1	1	3	1	6	6	
46	Truck, 2 1/2-ton, cargo, with winch						1	1	1	

Plate 21. T/O 8-136, April 1, 1942. Organization of Headquarters Detachment, Medical Battalion, Mountain Division.

The *administrative section* consists of 1 lieutenant colonel (battalion commander), 1 major (executive officer), 2 captains (1 a chaplain, 1 the plans and training officer), 1 lieutenant MC or MAC (adjutant), 1 master sergeant (sergeant major), 3 technicians grade 5 (1 chaplain's assistant, 1 light truck driver, and 1 a stenographer), and 7 privates first class or privates (4 light truck drivers, 2 orderlies, and 1 basic), a total strength of 5 officers and 11 enlisted men. (See T/O 8-136.)

Headquarters Detachment. The headquarters detachment is organized into a headquarters, a general and medical supply section and a motor maintenance section.

These sections perform similar functions to those of like sections in the headquarters detachment of the Medical Squadron. The personnel consists of 3 officers and 27 enlisted men.

The *headquarters* consists of 1 captain, MC or MAC (detachment commander and division medical supply officer), 1 first sergeant, a staff sergeant (mess and supply), a sergeant (motor), a corporal (company clerk), 2 technicians grade 5 (1 cook, and 1 automobile mechanic), and 6 privates first class or privates (1 cook, 2 cooks' helpers, 1 driver light truck, 1 mechanic automobile and 1 basic), a total strength of 1 officer and 11 enlisted men.

The *general and medical supply section* consists of 1 lieutenant (may be MAC), a technical sergeant (supply) 2 sergeants (supply), 2 technicians grade 5 (1 stock clerk, 1 light truck driver), and 6 privates first class or privates (2 general clerks, 3 light truck drivers, and 1 basic), a total strength of 1 officer and 11 enlisted men.

The *motor maintenance section* consists of 1 lieutenant (may be MAC), a staff sergeant (motor), 1 technician grade 4 (automobile mechanic), 2 technicians grade 5 (automobile mechanics), and 1 private first class or private (basic), a total strength of 1 officer and 5 enlisted men.

	1	2	3	4	5	6	7	8
	Unit	Technician head- quar- ters	Com- pany head- quar- ters	Sta- tion platoon	Col- lect- ing platoon	Total com- pany	En- listed cadre	Remarks
2	Captain.....		1			1		
3	Lieutenant.....			2	2	4		
4	Total commissioned.....		1	2	2	5		
5	First sergeant (585).....		1			1	1	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 61 War Department, 1942.
6	Staff sergeant, including.....		1	1	1	3		
7	Mess (824).....		(1)			(1)		
8	Platoon leader (651).....			(1)	(1)	(2)		
9	Sergeant, including.....		3	2	2	7		
10	Barr boss (710).....		(1)			(1)	(1)	
11	Liaison agent (503).....		(1)			(1)		
12	Section leader (652).....			(2)	(2)	(4)	(1)	
13	Supply (821).....		(1)			(1)		
14	Corporal, including.....		1	2	2	5	1	
15	Assistant section leader (652).....			(2)	(2)	(4)		
16	Clerk, company (405).....		(1)			(1)	(1)	
17	Technician, grade 4.....						2	
18	Technician, grade 5.....						1	
19	Private, first class.....						1	
20	Private.....						20	
21	Bugler (805).....		(1)			(1)		
22	Cook (840).....		4	(1)		(1)		
23	Cook (640).....		5	(1)		(1)		
24	Cook's helper (521).....		(1)			(1)		
25	Litter bearer (657).....				(11)	(11)		
26	Orderly (695).....		(1)			(1)		
27	Pack litter attendant (049).....		5		(7)	(7)		
28	Pack litter attendant (049).....				(15)	(15)		
29	Stableman (311).....		(1)			(1)		
30	Technician, medical (123).....		5		(3)	(3)	(1)	
31	Technician, medical (123).....				(5)	(5)	(1)	
32	Technician, sanitary (196).....				(2)	(2)	(1)	
33	Technician, surgical (225).....		4		(1)	(1)	(1)	
34	Technician, surgical (225).....		5		(2)	(2)		
35	Technician, surgical (225).....			(3)		(3)		
36	Basic (521).....		(1)	(2)	(4)	(7)		
37	Total enlisted.....		13	20	42	74	8	
38	Aggregate.....		14	25	44	83	8	
39	Q Animal, including.....		5	5	15	25		
40	Horse, riding.....		(1)		(3)	(3)		
41	Mule, pack.....		(4)	(5)	(13)	(22)		
42	Q Wagon, escort.....		1			1		

Plate 22. T/O 8-137, April 1, 1942. Organization of the Collecting Company, Medical Battalion, Mountain Division.

Collecting Company. There are 3 collecting companies in the medical battalion of the mountain division. Each collecting company is organized under a company headquarters, a station platoon, and a collecting platoon. (See T/O 8-137). The personnel consists of 5 officers and 78 enlisted men. The functions of the collecting company are similar to those of the collecting company of the Medical Squadron except that ambulance service is not provided. The *transportation* consists of 3 riding horses, 22 pack mules and 1 escort wagon. There are no ambulances in the collecting company of the Mountain Medical Battalion.

The *company headquarters* consists of a captain (medical officer, company commander), a first sergeant, a staff sergeant (mess), 3 sergeants (a barn boss, a liaison agent and a supply sergeant), a corporal (company clerk), 1 technician grade 4 (cook), 1 technician grade 5 (cook), and 5 privates first class or privates (1 bugler, 1 cook's helper, 1 orderly, 1 stableman and 1 basic, a total strength of 1 officer and 13 enlisted men. The functions of the company headquarters are similar to those of the company headquarters of the collecting company of a Medical Squadron.

The *transportation* of company headquarters consists of 1 riding horse, 4 pack mules, and 1 escort wagon.

The *station platoon* consists of 2 lieutenants, 1 staff sergeant (platoon leader), 2 sergeants (each a section leader), 2 corporals (each assistant section leaders), 1 technician grade 4 (surgical technician), 5 technicians grade 5 (3 medical technicians, and 2 surgical technicians), and 12 privates first class or privates (5 medical technicians, 2 sanitary technicians, 3 surgical technicians, and 2 basics), a total strength of 2 officers and 23 enlisted men. The *functions* of the station platoon are similar to those of a station platoon of a collecting company of a Medical Squadron.

The *transportation* of the station platoon consists of 5 pack mules.

The *collecting platoon* consists of 2 lieutenants, 1 staff sergeant (platoon leader), 2 sergeants (section leaders), 2 corporals (assistant section leaders), 7 technicians grade 5 (pack litter attendants, and 30 privates first class or privates (11 litter bearers, 15 pack litter attendants and 4 basics), a total strength of 2 officers and 42 enlisted men. The *functions* of the collecting platoon are similar to those of a collecting company of a Medical Squadron except that ambulance service is not provided. Patients are transported by means of pack litters.

Transportation consists of 2 riding horses and 13 pack mules.

Clearing Company. There is one clearing company in the Medical Battalion of a Mountain Division. Each clearing company consists of a company headquarters and 3 clearing platoons identical in organization, equipment, and transportation. The functions of the clearing company are similar to those of a clearing company of the Medical Squadron except that the clearing company provides, when practicable, the ambulance service for the division. The personnel consists of 14 officers and 137 enlisted men. For distribution see T/O 8-138, Plate 23.

The *transportation* of the clearing company consists of fifteen $\frac{3}{4}$ -ton ambulances, four 1-ton, 2 wheel trailers, (250-gallon water tank) four $\frac{3}{4}$ -ton command trucks, one $\frac{3}{4}$ -ton weapon carrier truck, nine $2\frac{1}{2}$ -ton cargo trucks, and three $2\frac{1}{2}$ -ton cargo trucks with winch.

Company headquarters. The company headquarters consists of a captain (medical officer, company commander), a first lieutenant, a first sergeant, 2 staff sergeants (mess and motor), 1 sergeant (supply), 1 corporal (company clerk), 4 technicians grade 4 (3 cooks and 1 automobile mechanic), 4 technicians grade 5 (3 cooks and 1 automobile mechanic), and 10 privates first class and privates (1 bugler, 2 cooks' helpers, 1 light truck driver, 3 orderlies and 3 basics), a total strength of 2 officers and 23 enlisted men.

The *transportation* of company headquarters consists of one 1-ton, 2-wheel, 250 gallon, water tank trailer, one $\frac{3}{4}$ -ton command truck, and one $\frac{3}{4}$ -ton weapon carrier truck.

Clearing platoon. There are 3 clearing platoons in the clearing company of a Mountain Medical Battalion. In addition to the functions of the clearing platoon of the medical squadron, the clearing platoon of a mountain medical battalion provides evacuation by motor ambulance when practicable from the collecting station or ambulance loading posts to the clearing station. Each clearing platoon is organized into a station section and an ambulance section (motor). Each platoon consists of 1 captain (medical officer), 3 first lieutenants (1 a dental officer), 1 staff sergeant (platoon leader), 1 sergeant (section leader), 2 corporals (1 section leader, 1 admission clerk), 2 technicians grade 4 (1 pharmacist, 1 surgical technician), 5 technicians grade 5 (1 heavy truck driver, 1 dental technician, 1 medical technician, and 2 surgical

technicians), and 27 privates first class or privates (3 heavy truck drivers, 6 light truck drivers, 5 ambulance orderlies, 3 medical technicians, 1 sanitary technician, 3 surgical technicians, 3 ward attendants, and 3 basics), a total strength of 4 officers and 38 enlisted men.

The *transportation* of a clearing platoon consists of five $\frac{3}{4}$ -ton ambulances, one 1-ton 2-wheel 250 gallon water tank trailer, one $\frac{3}{4}$ -ton command truck, three $2\frac{1}{2}$ -ton cargo trucks and one $2\frac{1}{2}$ -ton cargo truck with winch. (See T/O 8-138.)

1	2	3	4	5	6	7	8	9
Unit	Technician grade	Company headquarters	Station section	Ambulance section (motor)	Total platoon	Total company	Enlisted cadre	Remarks
2 Captain.....	1	1			1	4		
3 First lieutenant.....	1	(4) 3			(4) 3	10		
4 Total commissioned.....	2	4			4	14		
5 First sergeant (585).....	1				1	1		
6 Staff sergeant, including.....	2	1			1	1		
7 Mess (524).....	(1)				(1)	(1)		
8 Motor (813).....	(1)				(1)	(1)		
9 Platoon leader (651).....	(1)	(1)			(1)	(3)		
10 Sergeant, including.....	1	1			1	4	1	
11 Section leader (652).....	(1)	(1)			(1)	(3)		
12 Supply (821).....	(1)				(1)	(1)		
13 Corporal, including.....	1	1	1		2	7		
14 Clerk, admission (055).....	1	(1)			(1)	(3)		
15 Clerk, company (405).....	(1)				(1)	(3)		
16 Section leader (652).....			(1)		(1)	(3)		
17 Technician, grade 4.....						(1)		
18 Technician, grade 5.....						(1)		
19 Private, first class.....						(1)		
20 Private.....						(1)		
21 Bugler (803).....	(1)					(1)		
22 Cook (060).....	4	(3)				(3)		
23 Cook (060).....	5	(1)				(1)		
24 Cook's helper (521).....	(2)					(2)		
25 Driver, heavy truck (345).....	5		(4)		(4)	(1)		
26 Driver, heavy truck (345).....								
27 Driver, light truck (345).....	(1)	(1)	(5)		(6)	(19)		
28 Mechanic, automobile (014).....	4	(1)				(1)		
29 Mechanic, automobile (014).....	5	(1)				(1)		
30 Orderly (695).....	(3)					(3)		
31 Orderly, ambulance (696).....		(5)				(5)		
32 Pharmacist (149).....	4	(1)			(1)	(3)	(1)	
33 Technician, dental (067).....	5	(1)			(1)	(3)	(1)	
34 Technician, medical (123).....	5	(1)			(1)	(3)	(2)	
35 Technician, medical (123).....		(1)			(1)	(3)	(3)	
36 Technician, sanitary (195).....		(1)			(1)	(3)	(2)	
37 Technician, surgical (225).....	4	(1)			(1)	(3)	(1)	
38 Technician, surgical (225).....	5	(2)			(2)	(6)	(2)	
39 Technician, surgical (225).....		(3)			(3)	(9)	(3)	
40 Ward attendant (308).....		(3)			(3)	(9)		
41 Basic (521).....	(3)	(3)			(3)	(12)		
42 Total enlisted.....	23	32	6		38	137	18	
43 Aggregate.....	25	36	6		42	151	18	
44 Q Ambulance, $\frac{3}{4}$ -ton.....				5	5	15		
45 Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....	1	1			1	4		
46 Q Truck, $\frac{3}{4}$ -ton, command and reconnaissance.....	1	1			1	4		
47 Q Truck, $\frac{3}{4}$ -ton, weapon carrier.....	1					1		
48 Q Truck, $2\frac{1}{2}$ -ton, cargo.....		3			3	9		
49 Q Truck, $2\frac{1}{2}$ -ton, cargo, with winch.....		1			1	3		

Plate 23. T/O 8-138, April 1, 1942. Organization of the Clearing Company, Mountain Medical Battalion.

The *station section* consists of a captain, 3 first lieutenants (1 a dental officer), 1 staff sergeant (platoon leader), 1 sergeant (section leader), 1 corporal (admission clerk), 2 technicians grade 4 (1 pharmacist and 1 surgical technician), 8 technicians grade 5 (4 heavy truck drivers, 1 dental technician, 1 medical technician, and 2 surgical technicians), and 19 privates first class or privates (1 light truck driver, 5 ambulance orderlies, 3 medical technicians, 1 sanitary technician, 3 surgical technicians, 3 ward attendants, and 3 basics), a total strength of 4 officers and 32 enlisted men. The *functions* of the station section are similar to those of the like section of the clearing platoon of the clearing troop of a Medical Squadron.

The *transportation* of the station section consists of one 1-ton 2-wheel trailer (250 gallon water tank), one $\frac{1}{4}$ -ton command truck, three $2\frac{1}{2}$ -ton cargo trucks and one $2\frac{1}{2}$ -ton cargo truck with winch.

	1	2	3	4	5	6	7	8
	Unit	Technician grade	Company head-quarters	3 collecting and treatment platoons (each)	Evacuation platoon (motor)	Total	Enlisted cadre	Remarks
1								
2	Captain.....		* 1			* 1		
3	Lieutenant.....		1	2	1	8		
4	Total commissioned.....		2	2	1	9		
5	First sergeant (585).....		1			1	1	
6	Staff sergeant, including.....		1	1	1	5	2	
7	Mess (824).....		(1)			(1)	(1)	
8	Platoon (651).....			(1)	(1)	(4)	(1)	
9	Sergeant, including.....		2	3	4	15	1	
10	Barn boss (710).....		(* 1)			(1)		
11	Motor (813).....			(1)	(1)			
12	Section leader (652).....			((*) 2)	(3)	(9)		
13	Supply (821).....		(1)			(1)		
14	Veterinary (792).....			(1)	(3)	(1)		
15	Corporal, including.....		1	2	3	10	1	
16	Assistant section leader (652).....			((*) 2)	(3)	(9)		
17	Clerk, company (405).....		(1)			(1)	(1)	
18	Technician, grade 4.....					2		
19	Technician, grade 5.....					16	3	
20	Private, first class.....		18	22	14	33		
21	Private.....					47	1	
22	Clerk, admission (055).....		5	(1)	(3)			
23	Clerk, record (405) ^a		5	(1)	(1)			
24	Clerk, record (405) ^b			(1)	(3)			
25	Cook (060).....		4	(2)	(2)			
26	Cook (060).....		5	(2)	(2)			
27	Cook's helper (521).....			(3)	(3)			
28	Driver, heavy truck (245).....		5		(1)	(1)		
29	Driver, light truck (345).....		5	(1)		(1)		
30	Driver, light truck (345).....			(2)	(6)	(8)		
31	Driver, heavy truck (245).....				(2)	(2)		
32	Horseshoer (094).....		5	(1)		(1)	(1)	
33	Lead line rider (049).....				(*) 6	(18)		
34	Mechanic, automobile (014).....		5	(1)		(1)		
35	Orderly (695).....			(2)		(2)		
36	Orderly, ambulance, veterinary (697).....		(*) 1		(*) 3	(4)		
37	Packer, supplies (049).....			(*) 1		(3)		
38	Stableman (311).....			(1)		(3)		
39	Technician, medical, veterinary (250).....		5		(1)	(3)	(1)	
40	Technician, medical, veterinary (250).....				(5)	(15)	(1)	
41	Technician, surgical, veterinary (226).....		5		(1)	(3)	(1)	
42	Technician, surgical, veterinary (226).....				(2)	(6)		
43	Basic (521).....			(2)	(3)	(13)		
44	Total enlisted.....		23	28	22	129	9	
45	Aggregate.....		25	30	23	138	9	
46	Q Animal, including.....		3	14		45		
47	Horse, draft.....			(6)		(18)		
48	Horse, riding.....		(3)	(7)		(24)		
49	Mule, pack.....			(1)		(3)		
50	Q Trailer, 2-wheel, 2-horse van.....				3	3		
51	Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....					1		
52	Q Truck, $\frac{1}{4}$ -ton.....		1		3	4		
53	Q Truck, $\frac{3}{4}$ -ton, command and reconnaissance.....		1			1		
54	Q Truck, $2\frac{1}{2}$ -ton, cargo, with winch.....		1		2	4		
55	Q Truck, 4- to 5-ton, tractor.....				3	3		

* Mounted.
 * Qualified in sick and wounded record procedure.
 * 1 ambulance orderly for each 2-horse ambulance
 The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.

Plate 24. T/O 8-139, April 1, 1942. Organization of the Veterinary Company, Medical Battalion, Mountain Division.

The *ambulance section (motor)* consists of 1 corporal (section leader), and 5 privates first class or privates (light truck drivers), a total of 6 enlisted men. Each ambulance motor section has five $\frac{3}{4}$ -ton ambulances.

Veterinary Company. There is one veterinary company in the Mountain Medical Battalion. It is organized into a company headquarters, 3 collecting and treatment

platoons identical in organization, equipment, and transportation, and an evacuation platoon (motor). The personnel consists of 9 officers and 129 enlisted men. (See T/O 8-139.)

The functions and operation of the veterinary company are similar to those of the veterinary troop of the Medical Squadron.

The *transportation* consists of eighteen draft horses, twenty-four riding horses, three pack mules, three 2-wheel, 2 horse van trailers, one 1-ton 2-wheel 250 gallon water tank trailer, four $\frac{1}{4}$ -ton trucks, one $\frac{3}{4}$ -ton command truck, four $2\frac{1}{2}$ -ton cargo trucks with winch and three 4- to 5-ton tractor trucks.

Company headquarters. The company headquarters personnel consists of a captain (company commander, mounted), a lieutenant, 1 first sergeant, 1 staff sergeant (mess), 2 sergeants (a barn boss and a supply sergeant), 1 corporal (company clerk), 2 technicians grade 4 (cooks), 6 technicians grade 5 (1 record clerk, 2 cooks, 1 light truck driver, 1 automobile mechanic, and 1 horseshoer), and 10 privates first class or privates (3 cooks' helpers, 2 light truck drivers, 2 orderlies, 1 veterinary ambulance orderly and 2 basics), a total strength of 2 officers and 23 enlisted men. The functions of this headquarters are similar to those of the headquarters of the veterinary troop of the Medical Squadron.

The *transportation* of company headquarters consists of 3 riding horses, one 1-ton, 2-wheel 250 gallon, water tank trailer, one $\frac{1}{4}$ -ton truck, one $\frac{3}{4}$ -ton command truck, and one $2\frac{1}{2}$ -ton cargo truck with winch.

Collecting and treatment platoon. There are three collecting and treatment platoons in each veterinary company of the Mountain Medical Battalion. The *functions* of the collecting and treatment platoon are similar to those of the collecting platoon of the veterinary troop, Medical Squadron. The personnel of each platoon consists of 2 lieutenants, 1 staff sergeant (platoon), 3 sergeants (2 section leaders and 1 veterinary sergeant), 2 corporals (2 assistant section leaders), 3 technicians grade 5 (1 admission clerk, 1 veterinary medical technician, and 1 veterinary surgical technician), and 19 privates first class or privates (1 record clerk, 6 lead line riders mounted, 1 supply packer, mounted, 1 stable man, 5 veterinary medical technicians, 2 veterinary surgical technicians and 3 basics), a total strength of 2 officers and 28 enlisted men.

The *transportation* of the collecting and treatment platoon consists of 6 draft horses, 7 riding horses, and 1 pack mule.

Evacuation platoon (motor). The evacuation platoon (motor) consists of 1 first lieutenant (veterinary officer), 1 staff sergeant (platoon sergeant), 4 sergeants (1 motor sergeant, 3 section leaders), 3 corporals (assistant section leaders), 1 technician grade 5 (heavy truck driver), and 13 privates first class or privates (2 heavy truck drivers, 6 light truck drivers, 3 veterinary ambulance orderlies, and 2 basics), a total strength of one officer and 22 enlisted men. The *function* of the evacuation platoon (motor) is to evacuate all casualties by motor whenever possible and as designated by higher authority.

The *transportation* of the motor evacuation platoon consists of three 2-wheel, 2 horse van trailers, three $\frac{1}{4}$ -ton trucks, three $2\frac{1}{2}$ -ton cargo trucks with winch, and three 4- to 5-ton tractor trucks. One ambulance orderly is provided for each 2-horse ambulance trailer.

CHAPTER III

MEDICAL SERVICE OF THE DIVISION

Introduction. In order to understand the medical service of the division one must acquire a knowledge of the organization of its division medical personnel. This personnel consists of the officers and men of the

Medical detachments

Medical battalion (squadron)

Medical section of division headquarters.

Medical detachments are the *attached medical* units. They are an *integral* part of their respective regiments, battalions, and similar organizations. The organization and employment of these units is described in *Chapter I*.

The medical battalion, as an integral part of the division, operates the *division* medical service. This function is performed by units whose names are explanatory of their organization and type of division: *i.e.*

Medical battalion	<i>infantry division</i>
Medical battalion, armored	<i>armored division</i>
Medical battalion, motorized	<i>motorized division</i> X
Medical <i>company</i> , airborne	<i>airborne division</i>
Medical battalion, mountain	<i>mountain division</i> X
Medical <i>squadron</i>	<i>cavalry division</i>
Medical battalion, engineer amphibian brigade	<i>engineer amphibian brigade</i> .

The organization of these units is described in *Chapter II*.

It is the object of this chapter to discuss the coordination and relationship between attached medical units and the division medical service, and to enumerate the organization and discuss the function of the *medical section of division headquarters*.

The medical service of the infantry division is described in detail. Brief discussions of the operation of medical service in the armored, motorized, airborne, mountain, and cavalry divisions are included. The medical battalion, engineer amphibian brigade is included in this chapter as its function is similar to that of a division medical unit. For additional information on division medical service see FM 8-10, *Medical Service of Field Units*.

Responsibility. The commanding officer of a unit (army, corps, division, brigade regiment, battalion, etc.) is *responsible for all that his unit does or fails to do*. Commanding officers of units are therefore *responsible* for the *medical service* within their organization. The surgeon is in turn responsible for properly advising the unit commanders on all matters pertaining to the medical service.

Principles of Evacuation. The following principles are applicable to all types of divisions, including animal evacuation (which is executed by veterinary personnel operating under supervision of the medical corps):

Medical service is continuous.

The demands of *the military situation* are paramount. The fighting forces are to be relieved of the presence of sick and wounded as rapidly and thoroughly as possible. Disposition of medical units is aimed at administering the most good to the greatest number.

Medical personnel and medical units accompany the organization to which they belong *at all times*. When necessary, in rapid advances, casualties are left to be picked up by medical units from the rear.

Casualties in the combat zone are collected at medical installations along the general axis of advance of the units to which they pertain.

Sorting of the fit from the unfit takes place *at each medical installation in the chain of evacuation*. Evacuees who can be treated successfully in a limited period of time *within* a command are not evacuated unless it is necessary to relieve the medical unit of their care to free it for movement, or to make room for new casualties.

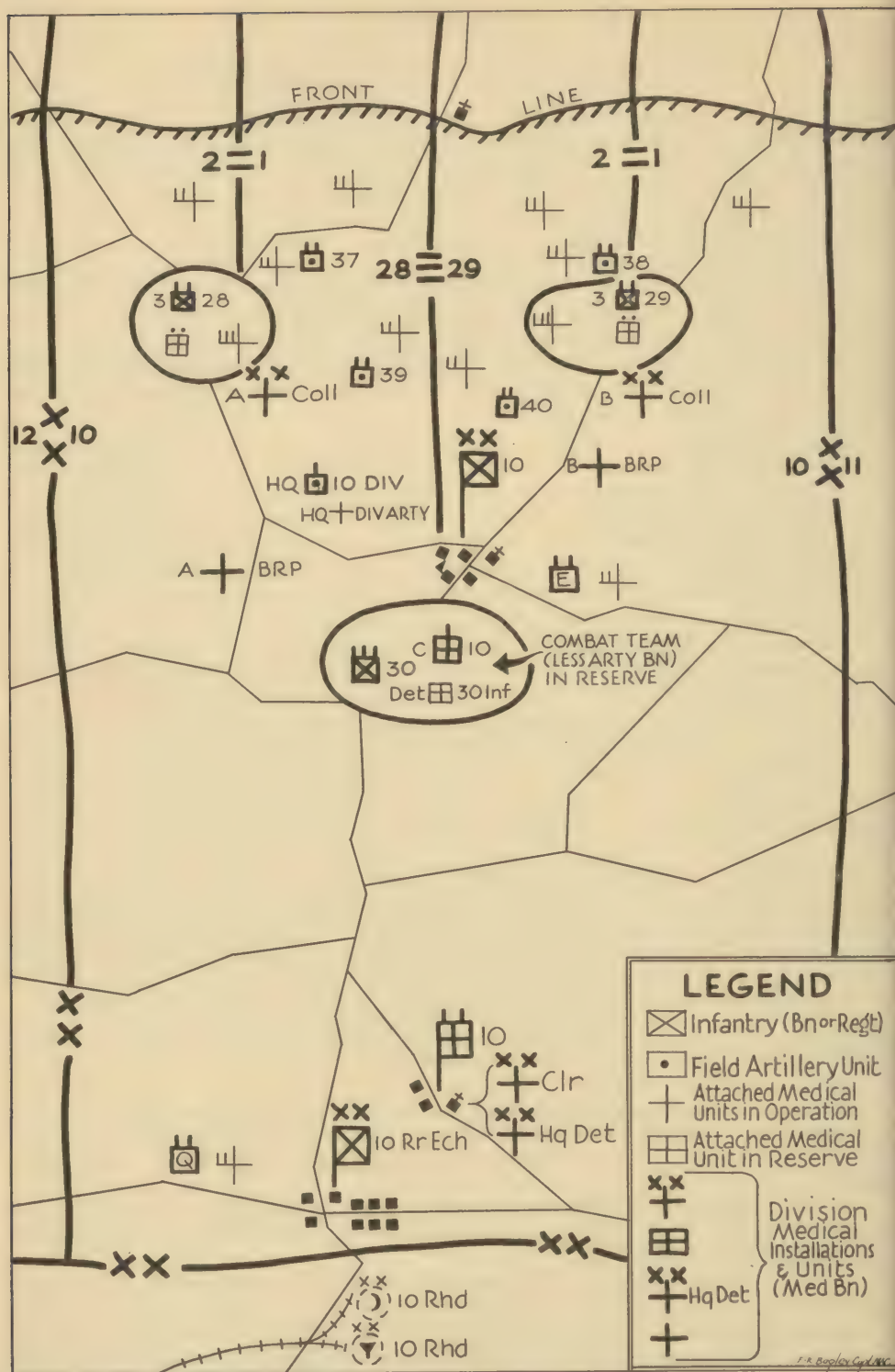


Plate 1. Medical Support of Infantry Division in Combat. (Schematic)

Medical units must possess and retain *tactical mobility* to permit them to move to positions on the battlefield in support of combat elements. Medical establishments are set up for operation only as required by the situation, or as foreseen to meet contingencies of the immediate future. Those not set up are held in reserve at a point where they are readily available.

In general, the size of medical units in the chain of evacuation increases, and the necessity and ability to move them decreases, the farther from the front lines medical installations are located.

Mobility of medical installations in the combat zone is dependent upon prompt and continuous evacuation by higher medical echelons.

THE INFANTRY DIVISION

Medical Section of Division Headquarters (Plate 3)

Tables of organization authorize a *medical section* as an organic part of *division headquarters*. The medical section of division headquarters is a separate entity from all other medical units of the division. It is organized to assist the division surgeon in the execution of his duties.

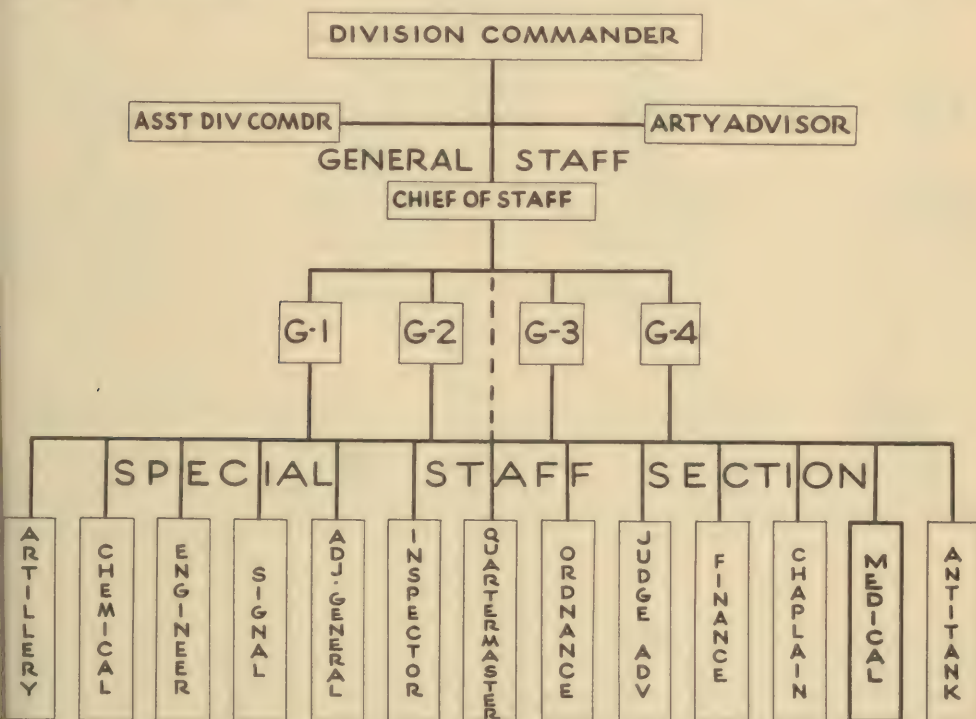


Plate 2. The Place of the Medical Section in Division Headquarters.

The *medical section*, including the division surgeon, operates as a section of the *division special staff*. (See Plate 2)

The senior medical officer of the division is a member of the division commander's *special staff*. He is called the *Division Surgeon*.

The *division surgeon* is a technical advisor to the division commander and his staff relative to:

All matters pertaining to the health and sanitation of the command or of occupied territory.

Food inspection for the division.

Technical supervision of the procurement and purification of water supply where emergency measures are necessary.

Care and disposition of the sick and injured.

Medical (dental, veterinary) supply for the division.

Training of *all troops* in sanitation, first aid, and hygiene.

Training of *all Medical Department* troops.

Reports and records pertaining to the Medical Department.

Personnel are provided in the medical section of division headquarters to assist the division surgeon in the performance of his gigantic task of supervising the medical activities of the division.

MEDICAL SECTION Headquarters Infantry Division

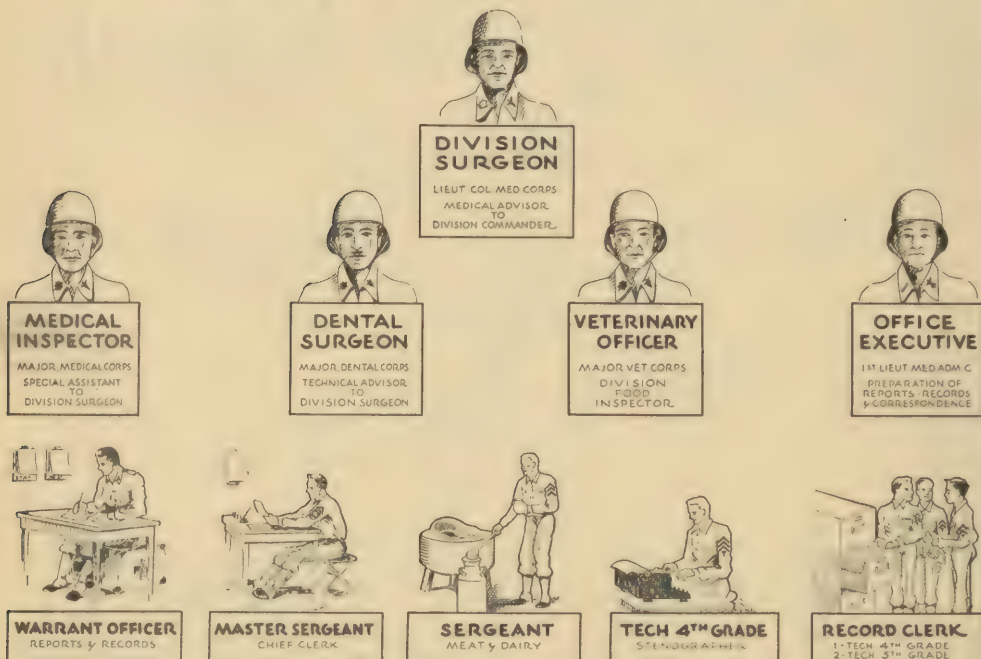


Plate 3. Medical Section of Division Headquarters.

Medical inspector. This officer makes periodic inspections of the divisional area, rendering reports to the division surgeon; Inspects all medical department activities within the jurisdiction of the division, including operation of the medical service in subordinate units; Supervises storage and distribution of medical supply; Supervises sanitary details of the division. He prepares statistical charts, reports, and records relative to the health of the division. The functions of *venereal disease control officer* are performed by the division medical inspector.

Division dental surgeon. This officer is an assistant to the division surgeon. He is responsible for the proper conduct of the dental service of the division. His duties are advisory, administrative, supervisory, coordinative, and professional.

Veterinarian. This officer, assisted by a qualified sergeant, inspects the food of the division and prepares veterinary reports. When animal units are attached to the division he supervises the operation of the veterinary service.

Office executive. The first lieutenant, medical administrative corps, is called the "office executive." He supervises the preparation of reports, correspondence, and records pertaining to the medical section of division headquarters.

The other personnel of the medical section include a warrant officer, a master

sergeant (chief clerk), and a sergeant (meat and dairy). A stenographer and 3 record clerks included in this organization are used as general assistants.

In combat the medical section, less the division surgeon, is at the *rear echelon* (See Plate 1. *Rr Ech*). The surgeon maintains close contact with the commanding general and the staff at the *division command post*. When duty requires his presence elsewhere, the surgeon leaves a capable assistant from the medical section to represent him at the command post.

The surgeon divides his time between the division command post, the medical battalion, and the medical detachments. He maintains contact by telephone with the medical section at the rear echelon when personal visits there cannot be made.

The division surgeon has no direct command over the medical battalion or the medical detachments. He is a *staff officer*. Within limits prescribed by the commanding general, the surgeon may exercise technical supervision over the operation of the medical battalion and the medical detachments of various units of the division, although the operation of these detachments is the responsibility of their respective commanders.

Following consultation with the medical battalion commander, the division surgeon makes recommendation to G-4 relative to the tactical employment of the medical battalion and its component parts. The approval of these recommendations forms the basis of the *medical plan*, which in turn is executed by the various medical units.

It is essential that the surgeon be thoroughly conversant with the various staff sections from which he secures information or supplies.

The General Staff Section

Chief of Staff: The surgeon will consult the *chief of staff* on matters not specifically allotted to a member of the general or the special staff sections. Matters in which there is doubt as to which staff section has jurisdiction are coordinated by the chief of staff.

G-1: Sanitation; measures for the control of communicable diseases of men and animals. Medical problems associated with prisoners of war, refugees, and inhabitants of occupied territory.

Personnel matters, and replacements for medical units.

Reports of *human* casualties.

Employment of prisoners of war to reinforce the medical service.

G-2: Nature and characteristics of weapons, missiles, gases, and other casualty-producing agents employed by the enemy.

The character of the organization and operation of the medical service of the enemy, especially as it relates to new methods which may deserve study and trial.

Communicable diseases in enemy forces.

Supply of maps.

G-3: Current information of the tactical situation; future plans.

Mobilization and training of medical units; training of all personnel in hygiene and first aid.

Signal communications in medical installations.

G-4: Tactical disposition of medical units.

Supply matters, both general and medical.

Movements of medical units.

Evacuation by higher echelons.

Reinforcement of the medical service by a higher echelon.

Hospitalization.

Shelter for medical troops and installations.

Coordination of nonmilitary welfare and relief agencies in medical installations.

Traffic restrictions affecting medical vehicles.

Reports of *animal* casualties.

Animal replacements for medical units.

All other matters which have not been specifically allotted to another general staff section, or wherein there is doubt as to which section has jurisdiction.

Engineer: Water supplies; sewage systems.

Road construction and maintenance in and around medical installations.

Construction, repair, and maintenance of roads and structures used by the medical service.

Preparation of signs.

Camouflage.

Maps.

Quartermaster: Disposition of the dead at medical installations; the sanitary aspect of the disposition of all dead.

Bathing, delousing, and laundry facilities for all troops.

Clothing for gassed cases, and other patients returning to duty.

General supply of medical units.

Procurement of land and existing shelter for medical troops and installations.

Procurement and operation of utilities allocated to the Quartermaster Corps. (See FM 100-10).

Transportation, land and water; motor and animal transport of medical units.

Chemical warfare officer: Gas defense of medical troops and installations; gas masks for patients.

Types of gas used, and methods of identification.

Toxicology and pathology of new gases.

Adjutant General: All official correspondence through command channels.

Personnel matters.

Postal service for medical units and installations.

Signal officer: Signal communications for medical installations.

Judge Advocate: Questions of military and civil law.

Administration of justice in medical units.

Headquarters commandant: Physical arrangement for the division surgeon's office.

Provost Marshal: Custody of sick and injured prisoners of war. Disposition of stragglers and malingers in medical installations.

EMPLOYMENT OF THE MEDICAL BATTALION, INFANTRY DIVISION

Introduction. The medical battalion is charged with evacuation of all casualties from infantry battalion and regimental aid stations. If for any reason, casualties cannot be gathered at aid stations, the collecting companies of the medical battalion may remove casualties directly from the field. The medical battalion always accompanies the division. Artillery casualties are generally evacuated from artillery aid stations directly to the division clearing station in *artillery ambulances*, which are included in the transportation allotted division artillery.

Plans for Employment. See *medical plan*, (Chapter VII).

Battalion Headquarters

Headquarters of the medical battalion together with personnel from the headquarters detachment establish the *battalion command post*. This should be located in vicinity of the clearing station—the focal point of division medical support. Here messages between the battalion commander and the collecting companies are received and dispatched by ambulance or other motor means. The headquarters detachment is also located in vicinity of the clearing station (See Plate 1). The close association of these units enables the medical battalion commander to maintain intimate contact and good control over his battalion. A telephone line generally connects the command post of the medical battalion with the division command post.

S O P and the Medical Battalion

A modern division designates routine procedures be handled by "SOP"—*standing operating procedure*. This system eliminates voluminous written orders and speeds all movements *provided* all personnel are well trained in its execution. In addition to many routine details, SOP designates the composition of division fighting units known as *combat teams*. The usual composition of a combat team is a regiment of infantry, a battalion of light artillery, a detachment of signal troops, a platoon of engineers and a *collecting company*. There are three combat teams in an infantry division. The troops

not included in combat teams are designated *division troops*. Therefore, the medical battalion, less its three collecting companies, is considered a part of division troops.

A collecting company normally accompanies the same combat team under all conditions. The combat team trains as a unit initially, thereby training its various officers and units to operate as one team. In operation, if a combat team is in reserve, its collecting company remains in reserve. Occasionally an entire collecting company will not immediately accompany a combat team to position for battle. Some collecting company personnel with ambulances and other transportation may remain behind with the medical battalion until such time as they are required in the operation of their company. This action shortens the length of the combat team march column, rendering it less vulnerable to air attack. Such parts as remain behind constitute a company reserve. Unless otherwise directed, this reserve is temporarily under command of the medical battalion commander until called for by the collecting company commander. It may be feasible for the battalion commander to use these ambulances for *short* missions—evacuating units on call—until such time as these vehicles are required by the collecting company.

Normally only one of the two platoons of the clearing company is initially established *at station*. The other platoon generally remains as a reserve in vicinity of the clearing station. It may relieve or reinforce the clearing station in operation, or it may be dispatched forward or rearward to establish a clearing station for the care of casualties occurring from major fluctuations of the front line. In other words, platoons of the clearing company must be prepared to reinforce each other, or *leap frog* each other, according to the number of casualties requiring treatment, and the progress of the combat troops.

Battalion headquarters and personnel of headquarters detachment establish the battalion command post in vicinity of the clearing station. The headquarters detachment normally sets up its installations in vicinity of the clearing station and the battalion command post. By centralizing the battalion headquarters and the headquarters detachment in vicinity of the clearing station—the *focal point of all division medical evacuation*—contact is readily maintained with collecting companies by means of ambulance-borne messages. By *dispersing* the transportation equipment, and personnel of these installations there is little likelihood of them being involved simultaneously in air bombardments.

In Attack. In attack, elements of the medical battalion are so disposed as to give greatest support to the *main effort* of the division—the zone of greatest expected casualty density. The medical battalion (division medical service) must be operated and disposed of in a manner that permits it to remain mobile that it may advance as necessary to give medical support to the division. All medical installations are established close to the front line in anticipation of forward movement of the combat troops.

Attack by Envelopment. Collecting companies establish collecting stations in the zone of operation of their own combat teams. If the front of the combat team making the secondary (holding) attack is very broad, and the litter carry long, it may occasionally be advisable for the collecting company with that combat team to split its personnel and equipment, thus establishing a collecting *post* in addition to the collecting *station*. Both units are then evacuated by the ambulances of that collecting company, utilizing an *ambulance control point*. (See Plate 13, Figure 3)

Each collecting company accompanies its own combat team. In the enveloping force (main effort) the collecting company remains mobile, establishing station only when the number of casualties and the disposition of the supported units warrant such action. Casualties may be treated during rapid forward movement by opening medical chests in the rear end of trucks for treatment of patients at the roadside. Evacuation by ambulance may be accomplished without establishment of a shuttle. The collecting company with the combat team in reserve remains in reserve but should be prepared to move when its combat team moves.

The clearing company establishes stations along the main axis of advance of the division. Occasionally on an encirclement a clearing platoon may be attached to the reinforced combat team making the encirclement.

Battalion headquarters and the headquarters detachment accompany the main clear-

ing station. They establish the battalion command post, the battalion supply and maintenance installations in vicinity of the clearing station.

In attack by penetration. Concentration of enemy fire will fall on the troops massed for the penetration. The attack will progress slowly until the enemy position has been ruptured. Casualties will be heavy initially. Upon rupture of the hostile position the intensity of enemy fire will be less, litter bearer evacuation will be safer; and medical installations may be moved close to the injured, and vehicular transportation of the wounded will become practicable. However, before displacing any medical installation forward, the possibility of success of enemy counterattacks must be considered.

In pursuit. Functioning medical installations continue to treat casualties in positions already occupied at the time the decision for pursuit is announced. Medical personnel are attached to the pursuing force and function as described for units of the medical battalion *in attack*. (See above).

In Defense. The medical problem is to locate medical installations in order to furnish medical support to the troops initially committed, yet have sufficient flexibility to permit medical support for extensions of the flanks or for counterattacks. In order to meet these contingencies, a reserve may be held out in each medical unit, or portions of each medical unit may be maintained mobile. The difficulties in evacuation are principally those due to the wide extension of the front and interference caused by enemy fire. Opportunity must be taken during lulls in the combat or in *darkness*, to push *ambulance evacuation up to the aid stations*.

Generally all medical installations are established farther to the rear in the defense to avoid being involved in minor fluctuations of the line. The collecting companies with combat teams in reserve also remain in reserve. They are committed with their combat teams and establish stations when the number of casualties intercepted warrant such action. The clearing company initially establishes station with one platoon, the other platoon being held in reserve to relieve the first one, or to expand the station.

With secure flanks. This is generally a passive (stable) defense. Movements of combat elements are generally restricted to the interior of the defended position. Such a position is strongly held and reserves are generally small. The mass of medical support is centrally located in the area of greatest expected casualty density and is not required to displace frequently.

With open flanks. This type of defense assumes an active mobile defense. Reconnaissance should be made for suitable locations of medical installations to support the plans of the combat troops to occupy previously prepared flank positions, or for counterattack of the enemy. To support of such operations must have medical officers necessitates a thorough knowledge of the plans of the combat troops.

Employment of the Collecting Company

There are three collecting companies in a medical battalion. Collecting companies are the forward echelon of the *division medical service*. They are the connecting links in the chain of evacuation between infantry aid stations and the division clearing station. Their mission in combat is threefold:

- (1) Remove evacuees from infantry aid stations to collecting stations.
- (2) Prepare evacuees at the collecting station for further evacuation.
- (3) Transport evacuees by ambulance from collecting stations to the division clearing station.

S O P and the Collecting Company. Speed through decentralization is the key to success under SOP. However, SOP requires a thorough understanding by, and training of all personnel involved in such operations.

Officers of collecting companies must be familiar with the *standing operation procedure* of their division. A division SOP will assign a collecting company to the same combat team for movement and medical support. This SOP will specify the location of the collecting company in the march column. Such a position is generally well to the rear of the column, behind all combat units. In some divisions only part of the collecting company may initially accompany the column, the other parts of the company remaining with the medical battalion until required by the collecting company.

Ambulances may be detailed to infantry battalions for the collection of march casualties. These vehicles return to collecting company control when march conditions cease. Prior to their departure from the collecting company bivouac area a rendezvous point must be designated for their assembly after the march.

During marches the collecting company is under control of the combat team commander. He may approve the initial location of the collecting station in some situations. The medical battalion commander must be kept informed of the location of the collecting company at all times. This may be done by motor messenger—most frequently by ambulances en route to the clearing station.

Medical troops must be intimately associated with the combat troops. A collecting company *must* train with its combat team. To have a collecting company remain in camp during the tactical training of these combat troops and then expect these medical soldiers to render efficient medical support during maneuvers and combat is an oversight that might easily be made by a commander. Medical troops will enhance the morale of the fighting man for he knows that his medical support will be given by officers and men who can withstand the same hardships and dangers as he, having trained with him from the organization of the combat team. Interest in training naturally lies with the fighting troops, but the medical game should always be played. In combat unattended wounded troops will lower morale and impede the progress of battle.

In Camp. In garrison, camp, or bivouac, collecting companies may be called upon to furnish ambulance service for regimental and battalion dispensaries. In addition to routine training, the collecting companies may furnish the personnel for the interior guard of the medical battalion. Personnel trained in sanitation may be used to assist the division medical inspector in instruction on methods of insect control, and of garbage and waste disposal. However, these men are to be used for *instruction, supervision, and inspection only* and *do not actually engage in the execution of the work.*

On the March. Collecting companies furnish personnel, transportation, and equipment for collection of march casualties. The method of collection of march casualties is dependent upon the type of march made. Casualties are collected by ambulances and are usually evacuated directly to the clearing station.

Motor marches. When infantry troops are transported by truck, an ambulance may be detailed to follow in rear of each battalion, accompanying the attached medical troops. Casualties occurring are treated by the battalion medical section and are transported by ambulance.

Combined foot and motor marches. Ambulances are not attached to the medical detachments, but *march collecting points* may be designated prior to marches. March collecting points are merely points along the route of march, easily identified on a map and on the ground, where casualties may be assembled. These points are not manned by collecting company personnel, but are visited by collecting company ambulances, which traverse lateral roads when possible to lessen interference with the marching troops.

Foot marches. *March collecting posts* are generally designated for care of casualties of foot marches. A march collecting post is a station along a route of march where attached medical personnel may transfer to the division medical service (collecting companies) such casualties as are unable to march. Each post is operated by one or more men of a collecting company, and is equipped with litters, blankets, and medical supplies. A supply of water is desirable. These posts are located adjacent to the route of march and are evacuated by ambulances utilizing parallel routes, when available. When all units have passed the march collecting posts, and all casualties are evacuated the personnel manning them are gathered by ambulance and returned to the collecting company.

Security Detachments. One or more ambulances with a few litter bearers may be detailed by one collecting company to accompany the cavalry reconnaissance troop of the division. These vehicles generally march with the radio equipped service elements of the troop. They may be dispatched to collect casualties by means of radio messages within the radio net of the troop.

When a large body of troops, such as a battalion, is sent out as an advance guard or a flank, or a rear guard, one or more ambulances may be detailed to accompany the medical section of such a unit. These ambulances will return to control of the collecting company upon cessation of the movement, or upon relief of the guard.

Evacuation of Artillery Casualties. Collecting companies rarely establish contact with the aid stations of division artillery because medical detachments of division artillery are organically equipped with ambulances. Artillery casualties are normally evacuated directly from the artillery aid stations by their own ambulances. Casualties among artillery personnel are normally less than in infantry units, and the attached medical personnel of artillery are generally able to prepare and evacuate their casualties directly to the clearing station. When artillery casualties occur beyond the capabilities of their own transportation, collecting companies may be called upon to furnish ambulances to assist in their evacuation.

Functions of the Collecting Company. The functions of the collecting company in combat are fourfold:

(1) *Contact.* To establish and maintain contact with the medical detachments of combat troops—the regimental medical detachment of the infantry rifle regiment.

(2) *Treat.* Establish and operate a collecting station, administering the treatment necessary to return minor casualties to their units, or to prepare more seriously injured casualties for further evacuation to the rear.

(3) *Evacuate.* To relieve the medical detachments of casualties, moving these casualties to the clearing station or returning them to duty.

(4) *Transportation.* Transport casualties to the clearing station.

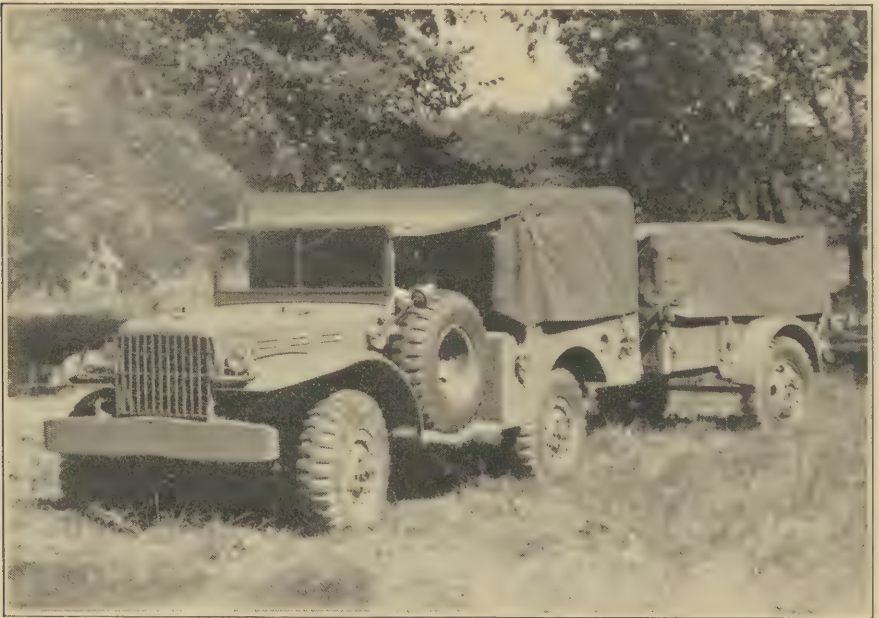


Plate 4. A 3/4-ton Weapon Carrier with Trailer (Collecting Company Transportation).

Preparation for Combat. The preparation of the collecting company for its arduous service functions during combat is important. Essential features of this preparation are that vacancies in the company should be filled by requisitions for filler replacements. Company transportation, equipment, and individual clothing and equipment should be inspected, repaired, and checked by the company officers. Missing and unserviceable items should be replaced. All company property should be repaired and placed in the best condition possible. Missing expendible items of chests should be replaced. Additional medical supplies and expendible items should be drawn from headquarters de-

tachment in anticipation of combat requirements. Rations and gasoline will be drawn at the time, place, and in quantities specified by division SOP.

All unit identification must be removed from organization equipment and distinctive insignia must be removed. All papers relative to unit designations must be disposed of, and check made on vehicles to be sure no identifying papers are found in glove compartments or unit identifying numbers painted on surface. Medical department chests, quartermaster issue buckets, kitchen mess washing cans, gasoline containers, and other galvanized equipment must be darkened in order to avoid reflections of sunlight or night flares. This may be satisfactorily done by applying to the *clean* galvanized surface (for no longer than five minutes) a mixture of 5% copper sulfate in household vinegar. The mixture must be carefully washed off at the end of 5 minutes. The appearance should be a dull dark grey. Should the first coat be too light the process may be repeated. Care should be exercised to prevent the mixture from corroding the entire thickness of the galvanized coating. This coating is much more satisfactory than paint which chips and blisters.

Orders. The company commander receives his orders either from the medical battalion commander or the combat team commander depending upon whether the company is operating as part of the battalion or as attached to a combat team. Orders are either oral or in the form of written messages. Most generally they are oral-dictated or fragmentary. SOP is not mentioned in orders unless to make a variation of it. Orders given by the company commander are oral, unless a written message is utilized to transmit an order to a detachment of the company some distance away.

Plans. Routine plans for operation of the company should be written as company SOP. Such details as loading schedules for transportation of equipment, the designation of where personnel are to be transported in the company vehicles, and location of vehicles in the column should be set forth in this document. With SOP as a working basis, the company commander may make plans for general employment of his company, knowing details of the execution will be carried out without mention. In anticipation of forward or rearward displacement of his unit, the company commander must have several plans for location of his installations based upon map studies and ground reconnaissances.

Each plan must include location of the collecting station, the basic relay post, the ambulance shuttle, and probable litter routes for the evacuation of the aid stations.

Recommendation for the location of a collecting station should be submitted to a combat commander for approval to avoid conflict with other units operating in the area. Sites which are suitable for the station (see subsequent paragraph) are frequently required for artillery positions, engineer dumps, or for reserve troops. In case of conflict, combat troops have priority. Therefore, medical officers should be prepared to recommend alternate areas for the location of these medical installations.

Before making a recommendation for the location of a station, the officer responsible should make at least a map study. Ground reconnaissance is much to be preferred, but time may not permit it. Situations may arise where either the division surgeon, the medical battalion commander, or the collecting company commander will have to recommend the location of the collecting station.

The division surgeon is the staff representative of the medical service. He usually would make the recommendations to G-4 for the location of all division medical installations. However, he should consult the medical battalion commander before such action is taken. Under some situations the battalion commander might deal directly with G-4.

In a meeting engagement (development from a march) or in a tactical situation where a combat team is making a wide envelopment or encirclement, speed of action is essential in locating a collecting station. In such situations the company commander will generally initiate action by recommending the location of his collecting station to the combat team commander, informing his medical battalion commander of the approved site of this installation.

In some rapidly moving situations, the company commander may have to establish station and then request approval of its location.

Location of a Collecting Station. Since a collecting company must evacuate aid

stations of the infantry, the most important factor in determining the location for a collecting station is the position of these several aid stations. This entails a knowledge of infantry battalion boundaries and a map study or reconnaissance of a narrow belt of terrain some 500 yards to the rear and paralleling the line of departure or main line of resistance, in order to determine the probable location of aid stations. In a prepared attack or prepared defensive position this information may frequently be obtained in advance. In a meeting engagement, such advance information of combat elements may not be available, but usually fairly accurate deductions may be made. In such situations it may be advisable to move the collecting company initially to a concealed position and hold it in readiness to advance to position after the tactical situation has developed and aid stations have been located.

Desirable sites: A position intercepting the natural lines of drift of the wounded is desirable. Wounded men who are able to walk make their way to the rear seeking treatment. Some follow the only route they know, which is the one over which their organization advanced, even though it is exposed to hostile fire. Others instinctively avoid enemy observation and fire, particularly machine gun fire, by following ravines, stream beds, and other defiladed byways. These routes are known as the natural lines of drift of wounded, and must be considered in the location of all medical installations near the front.

A location with sufficient defilade from elevations of terrain, for protection from direct small-arms fire and from flat-trajectory artillery fire, is required for protection of personnel and equipment. A distance beyond the effective range of hostile artillery fire renders a collecting station useless. Cellars, brick, concrete or stone buildings may be utilized. In stabilized situations dugouts may be constructed.

Positions in woods or beneath cover not under direct enemy observation should be sought. Concealment is essential. The location medical installations afford the enemy a reliable index to other troop dispositions of the division. *Do not underestimate the intelligence of your enemy.* Camouflage your unit. A medical soldier or a medical truck looks like any other military unit from a distance. Don't reveal your medical unit's location by careless camouflage discipline.

Reduce to a minimum the distance of the litter carry. The average carry should not be more than 1500 yards. Increase of this distance reduces the efficiency of casualty collecting. Do not locate so far forward as to become involved in minor fluctuations of the line.

Locate near the center of the zone of action or the sector of the combat team. This will equalize the distances from the several aid stations, and is extremely desirable unless there be urgent reasons to the contrary. Probable areas of casualty density must be considered.

The site selected must be accessible to ambulances. However, blocked or destroyed roads, or intensity of enemy fire may prevent ambulances from reaching the station for varying periods. In extreme situations ambulances may be able to evacuate the collecting station only at night.

Considerable accumulations of wounded may occur. The site must be sufficiently large to permit parking and movement of motor vehicles and the dispersion of personnel and evacuees. Firm ground is essential.

A site adjoining a supply of water is desirable but not essential, for among the collecting company equipment is a 250 gallon water trailer.

One must consider that the location of a collecting station will depend upon the terrain, the road net, the enemy capabilities and the nature of the operation (attack, defense, etc.). No fixed rules can be laid down, but certain guides may be followed. A collecting station should rarely be nearer than 1200 yards from the front line, nor should it be farther than 3500 yards from that line. It should be near the center of the zone of action in a lateral direction, other things being equal.

Undesirable sites: A location which permits enemy observation and fire should be avoided. Positions so close to the firing line that they permit the station to become involved in minor fluctuations of the infantry combat positions must be avoided. Close proximity to bridges, fords, important crossroads, ammunition distributing points, artil-

lery and heavy weapons positions must be avoided to prevent destruction of the station by enemy fire directed at those targets.

Average location: Bearing in mind exceptions to the foregoing guides, an average location for the location of a collecting station may be described as a concealed and protected position about one mile from the front line, not adjoining any possible enemy targets, equidistance from the lateral boundaries of its zone of action, and on or near a road leading to the rear. (See Plate 1.)

Movement of the Company to the Collecting Station Site. Under many situations the company commander will be forward completing his reconnaissance for the location of the collecting station when the company moves forward with the combat team march column. Prior to his leaving the company bivouac area the company commander will know what time the combat team march column will leave the bivouac area and what route the column will follow. After completion of his reconnaissance the company commander may return and guide the collecting company forward to the site he has chosen for the station, but frequently he will send a guide back to meet and direct the company into the site he has chosen. He can utilize additional time in studying the terrain, planning for sites for establishing departments of the station, parking and camouflaging of transportation, and obtaining contact with the infantry aid stations.

The company will move forward by motor in *open column*, or by *infiltration*, depending upon the division SOP and the decision of the division commander. *Frequently occupation of positions will be made under cover of darkness exercising complete black-out precautions.* Close supervision by officers and noncommissioned officers is required to maintain camouflage discipline. At night troops must avoid revealing positions by unauthorized display of lights, or by leaving foot or vehicular tracks during the night which will reveal positions when viewed from the air by day.

Establishment of the Collecting Station. Unit training and company SOP should permit the establishment of the station within a very few minutes. The collecting station personnel should be dispersed to limit the number of casualties occurring from a single shell or bomb burst and may be organized into the following main departments:

Receiving and property exchange

Litter wounded

Walking wounded

Forwarding and property exchange (where a numerical record of patients is kept on a blotter)

The company command post and message center are preferably located near the receiving department. The kitchen generally continues to operate inside the 2½-ton truck. It prepares hot drinks for the patients and mess for the personnel. It may move to the basic relay post occasionally to mess the ambulance and motor maintenance personnel who are gathered there. A place removed from line of vision of the station must be set aside for a morgue. Gas casualties must be treated in a place removed downwind from the collecting station. Certain station personnel must be designated to treat these casualties.

Receiving department and property exchange. Patients arrive at the receiving department as two main groups; Litter wounded and walking wounded. These casualties may occur in approximately equal numbers. These two general groups are separated for treatment. A medical officer of the station platoon may work at the receiving department. He quickly examines each evacuee either by inspection or by reading the emergency medical tag. He makes a diagnosis and may render urgent emergency treatment. He directs walking wounded to their treatment section, and determines priority of treatment of litter wounded by directing *station personnel* to carry them to the litter wounded department. A noncommissioned officer, usually the Staff Sergeant (Platoon Leader), supervises the litters, blankets, and splints at the receiving department. He checks all litter squads to be sure that they are executing a correct property exchange. In the absence of an officer he will establish priority of treatment and directs walking wounded to their treatment section. Persistent gas casualties must be shunted to the gas treatment section and prohibited from entering the station proper.

Litter wounded department. Patients should be prepared for evacuation by these per-

sonnel. However, all treatment at a collecting station is based upon the most good to the greatest number. A large percentage of patients will arrive in good condition having been adequately treated at aid stations. They will require little additional treatment before evacuation. (However, patients may arrive who have received inadequate treatment because of having been missed by aid station personnel, because of rapidity of action.) Patients may arrive at a collecting station without having received adequate treatment but a patient should never leave a collecting station without having received a secure splint, an adequate dressing, or other necessary emergency treatment.



Plate 5. Receiving Department of a Collecting Station. (Patient on a Wheeled Litter).



Plate 6. Litter Wounded Department of a Collecting Station.

All patients are examined, checked, dressed or redressed as necessary. Only simple emergency operative procedures are executed at a collecting station. Tourniquets found on patients are removed and hemorrhage controlled by a more permanent hemostasis. The personnel of this department may be a medical officer, a noncommissioned officer, technicians, and privates necessary to assist in the preparation and administration of hypodermics, assist in the operation of shock litters, and assist in general. A subsection of the litter wounded department may be necessary for the treatment of surgical shock. Patients in shock may be treated in groups by elevation of the foot of their litters on medical chests or lantern crates. By means of blankets and canteens (discarded by casualties) filled with hot water, heat may be applied. Lighted lanterns placed beneath the elevated litters have been used in the administration of heat. Plasma may be administered if available.



Plate 7. Shock Treatment in a Collecting Station.

Three blankets may be made to provide four layers under and over the patient in the following manner. Place the first blanket on the litter lengthwise so that its long edge corresponds to one pole of the litter, and fold it once back upon itself until the folded edge falls atop the opposite pole. Place the second blanket lengthwise upon the litter so that its long edge is atop the folded edge of the first blanket. Fold the second blanket back upon itself once until its fold is above the litter edge of the first blanket. Place the patient upon the litter atop the doubled folds of the first two blankets. The third blanket folded lengthwise once is placed over the patient. The free edges of the two lower blankets are then brought atop the third blanket giving 4 layers of blanket beneath and 4 layers of blanket atop the patient.

Walking wounded department. Triage, or separation of walking wounded from malingers and those suffering minor injuries is most important. Medical officers operating such departments must quickly separate those who need treatment from those seeking excuses to avoid remaining in the combat area. Slightly wounded not requiring further evacuation should be given necessary dressings and medication and returned to their organizations. Malingers may be instructed to return to their organizations, or if particularly troublesome may be turned over to military police for return to their organizations. Some divisions have the military police call at collecting station sites on routine scheduled hours. Other units will collect stragglers and malingers at points

along a "straggler line" generally in rear of collecting stations. Walking wounded requiring treatment prior to evacuation are given required treatment by personnel in this department which generally consists of one medical officer, a noncommissioned officer, and one or two technicians or privates.

Forwarding department and property exchange. A noncommissioned officer operates the forwarding department. He has sufficient enlisted personnel assisting him to load the ambulances and keep an informal blotter record of casualties handled by the collect-



Plate 8. Walking Wounded Department of a Collecting Station.

ing station. The man operating this department must supervise a correct exchange of blankets, splints, and litters between the ambulances and the collecting station. He will supervise the loading of walking wounded and litter wounded, giving priorities to cases as determined by station personnel. He must instruct ambulance chauffeurs or orderlies relative to place of delivery of written messages and requisitions for medical supplies carried by them on their trip to the rear. He must also check with ambulance personnel for any supplies they may have brought with them on their forward run. Patients with communicable disease, and those who are casualties from persistent gas must be segregated and evacuated by separate ambulances.

It is essential that the noncommissioned officer at the forwarding department supervise the exchange of property between the company ambulances and the station. He checks the ambulance orderlies and chauffeurs in their transfer of litters, blankets, and splints to the station in exchange for those loaded into the ambulance with evacuees.

The record kept at the forwarding department is merely numerical. No form is specified in regulations for this record. It may be merely a pencil tabulation in a notebook. It should be sufficiently complete to inform higher authority at any time of the number of casualties evacuated. The detail required in such reports will be designated by the division commander. However, the personnel of a collecting company is not of sufficient number, nor is it organized to keep voluminous and detailed records. Adding the burden of administrative detail will retard the speed of evacuation without adding to information that might well be secured from the clearing station or medical detachments with combat troops.

The command post and message center. The command post and message center are considered together inasmuch as the former is served by the latter. They should be

located out of the way of patients being moved through the station. The command post may be placed in the station site where it will be camouflaged, yet convenient. The message center is best placed near the receiving department, where the man operating the message center can ask each litter bearer squad or walking wounded man whether he is carrying a message for the station. Men should be instructed to ask this of each group or individual, for frequently in the stress of battle men forget they are carrying messages in addition to their other duties. The message center receives and transmits written messages and papers pertaining to medical units in the chain of evacuation; occasionally official documents pertaining to other units. Messages sent from the collecting station should be sent to the message center in duplicate. The message center will make a record of the time forwarded on a "message center log," an informal paper which aids in determining whether all messages forwarded have been received.



Plate 9. Forwarding Department of a Collecting Station.

The original copy of the processed message is forwarded to its destination together with a message receipt. The duplicate of the processed messages is held in a *live file*—a large envelope—until such time as the message receipt is returned. Upon return of the signed message receipt the number recording the message outstanding is checked off and the duplicate message is placed in a *dead file*—another envelope. The message center records are usually closed at hour 2400, and the message center log and dead messages of each 24 hour period are forwarded to the medical battalion adjutant for inclusion in the historic records of the battalion.

Kitchen. With the modern quartermaster gasoline fired stove units a mobile supply of hot drinks may be kept for patients at all times. In most situations it is advisable to keep the kitchen loaded and operating inside the body of its 2½-ton truck, for loading or unloading of stove units in operation is extremely hazardous, and would have to be done frequently in rapidly moving tactical situations. In situations where ambulance evacuation is extremely slow, nourishment may be administered at a collecting station. With personnel of the company scattered from battalion aid stations to the clearing station, the ingenuity of the company commander, the mess officer, and the mess sergeant must be exercised to the maximum to feed the company. Food may have to be distributed in food containers, but in actual combat, "C" ration or other concentrated rations may be distributed to the troops,

Morgue. This is merely a place designated where those who die at the station are placed until they can be taken over by quartermaster or unit burial details. It should be placed out of sight of evacuees passing through the station.

Gas treatment section. Should gas be used by the enemy in the zone of action of the combat team, treatment must be begun by collecting company personnel until reinforcements arrive to take over this work. A limited amount of gas casualty treatment equipment is available in collecting companies, and personnel to administer treatment must be improvised from personnel within the company, as none is authorized for this section. When operating, this section must be set up *downwind* from the station, and separate ambulances must transport all evacuees suffering from persistent chemical agents.

Gas treatment battalions, (G.H.Q.) are attached to combat areas where gas is used extensively. They are organized and trained for this type of work. (See T/O 8-125.) Such a battalion is composed primarily of three gas clearing companies. A platoon of one of these companies may establish an installation in vicinity of the collecting station.

Decontamination of persistent agent casualties must be performed rapidly to avoid extensive injury. Personnel caring for this type of casualties must wear special protective clothing and gauntlets in addition to their gas masks. In absence of ambulance reinforcements certain ambulances must be designated to transport all gas casualties, and these vehicles must be decontaminated upon completion of this service. They should be driven with windshield and rear doors tied open to insure adequate ventilation when hauling persistent agent gas casualties.



Plate 10. Contact Agent Describing Location of an Aid Station to Collecting Company Commander.

The Liaison Section. The responsibility for contact (liaison) with units supported is a responsibility of the collecting company commander. There is authorized for a collecting company a sergeant who is designated *liaison agent sergeant*. He is generally employed to keep track of the contact agents. Other members of the liaison section must be improvised from personnel within the company. Any personnel may be used, but judgment should be exercised so as to not remove any personnel from key positions in the company. Men chosen as contact (liaison) agents should be intelligent and resourceful, trained in the use of maps and compass, and they must be able to move across terrain using it to advantage in order to avoid becoming casualties.

There are two major means for original employment of contact (liaison) agents.

They may be transported with the company to the collecting station site from where they are dispatched forward to find the aid stations. Upon finding the aid station to which dispatched, an agent will return to the collecting station, report his findings, and guide the litter bearers forward. The other method is to inform the agents of the contemplated location of the collecting station and detail the agents to the attached medical sections prior to leaving the combat team assembly area. In this method the agents will return to the collecting station which may be easier to find because of its larger size. They will then act in a manner similar to the first method by telling the company commander the location of their aid station, and guiding forward litter bearers to evacuate it.

Upon return to the aid stations the contact agents remain with the battalion surgeon keeping the collecting company commander informed of the situation. They transmit pertinent information to the rear by written messages transported by litter squads. Messages of special importance are usually sent in duplicate by two different squads, the duplicate copy being clearly marked "duplicate." Occasionally ambulances may be used as a means during operation of advance ambulance shuttles. Rough sketches completely labeled may be clearer than detailed written information. Walking wounded may be used as a delivering agency when no other means are available, but they cannot be considered entirely reliable.

The Collecting Platoon. This unit is composed of a litter bearer section and an ambulance section. Current tables of organization authorize a medical administrative corps officer (or warrant officer) as platoon leader and place him in the ambulance section for operation.



Plate 11. Litter Relay Post. Transfer of Evacuee From Hand Carry to a Wheeled Litter.

The Litter Bearer Section. Litter bearers are used to transport patients between battalion aid stations and the collecting station when motor vehicles cannot be used for this evacuation. The assembling of litter cases at the collecting station is a slow procedure. An additional duty of this section is to clear the field of wounded when the tactical situation has been such that attached medical units have neglected clearing the field in order to keep up with their attached units.

A squad of four litter bearers ordinarily accomplishes quicker evacuation than two man squads because the labor involved is exhausting. Two bearer squads may be

efficient for short litter carries when they are not required to make many trips. Assuming that the average distance between the collecting station and an aid station is 1200 yards a litter bearer squad will require one hour per round trip. However, the time actually required is dependent on many factors such as inclement weather, mud, rough ground, density of undergrowth, time of day or night, intensity and type of enemy action, and the fatigue of the litter bearers.

Some means within the company are available to assist in reducing the time of litter collection. Wheeled litter might be used where roads or smooth terrain permits, and litter relay posts may be utilized to shorten the haul and permit frequent rests of bearer squads. (See Plate 11). An advance ambulance shuttle operating between the collecting station and advance ambulance loading post, or even to a battalion aid station at night or during lulls in enemy activity, will greatly speed evacuation. Displacement of the station forward will of course aid in speeding either type of evacuation. When authorized by the commander, prisoners of war may be used to supplement company personnel.

The *litter bearer section leader*, a sergeant, is in charge of the litter bearers. He has a corporal to assist him. He details squads to accompany liaison agents forward to battalion aid stations, organizes litter relay posts as directed, and supervises work of his section. He maintains close contact with litter bearer squad leaders and keeps the company commander constantly informed of the condition and operation of his bearer section.

The Ambulance Section. The most important function of the ambulance section in combat is to transport casualties from the collecting station to the clearing station. When opportunities are afforded it also evacuates battalion and regimental aid stations directly. It also may be used to transport messages during employment of its ambulances and may also transport medical personnel and supplies in addition to casualties. It also transports the litter bearer section of the company, and furnishes the transportation necessary for the collection or march casualties.

The collecting station is generally established at a point accessible to ambulances. Local conditions may prevent the approach of ambulances to the station over a period of several hours, and on account of enemy activity it may be impracticable to reach collecting stations except at night.

It is desirable to conserve the strength of the litter bearer section by hauling them to the collecting station site. When this is done vehicles may move forward and rearward by infiltration to avoid aerial observation and attracting enemy artillery or aircraft bombardment. Drivers must be trained to avoid making obvious and unnecessary tracks that might be picked up on enemy airphotos.

The ambulance shuttle. Generally one empty ambulance is camouflaged and placed at the collecting station forwarding department, which is known as an *ambulance loading post* (ALP). It moves to the rear when fully loaded with evacuees. One or more groups of two ambulances each are placed behind the collecting station at distances of 150 to 600 yards between groups. These grouping of 2 vehicles are known as an *ambulance relay post* (ARP). The remainder of the vehicles are gathered in a defiladed position with overhead cover, or are camouflaged. They should be well dispersed to prevent more than one being destroyed by a single shell or bomb. The place where these vehicles are parked is known as the *basic relay post* (BRP). (See Plate 13). Basic relay posts are generally 600 yards to 2 miles behind the collecting station. The shuttle may be established either by dropping vehicles off at the points designated as relay posts on the trip forward to the collecting station, or it may be established when the vehicles have discharged their loads of litter bearers and are headed back to the basic relay post. The latter method is advantageous in that it gives the ambulance drivers an opportunity to see the location of the collecting station. However, it requires each driver dropped at a relay post to turn his vehicle about on the road in order to be headed toward the collecting station.

As an ambulance loaded with evacuees leaves the collecting station (ALP) it moves directly to the clearing station. As it passes relay post(s) on the way to the rear its passage is the signal that another vehicle is needed forward. Upon noting the approach

of the rearward bound ambulance each vehicle in the shuttle moves forward one place, occupying the position previously occupied by the vehicle in front of it, until the place at the collecting station site (ALP) is reached. At the ALP patients are loaded, property is exchanged, and as soon as the ambulance is loaded it again moves to the clearing station on another round trip.

The reservoir for ambulances is at the *basic relay post* (BRP) to which all vehicles having completed a trip to the clearing station return. At the basic relay post the



Plate 12a. Ambulance 3/4-Ton 4x4. Used For All Infantry and Motorized Divisions and in Corps and Army Medical Units.



Plate 12b. Inside View of 3/4-Ton 4x4 Ambulance, Heater is Obscured by Ambulance Orderly's Seat.

ambulances are serviced, the personnel are rested, and usually the motor maintenance personnel operate in their maintenance capacity. Personnel may be messed at the BRP by moving the kitchen to them from the collecting station, or they may be fed in relays by moving forward to the kitchen at the collecting station site.

Advantages of the shuttle system. This system places ambulances at the collecting station at the rate at which they are loaded and dispatched.

It permits a steady flow of patients through the collecting station to the clearing station.

It avoids the unnecessary massing of transport in the forward areas.

It minimizes the danger of damage to ambulances by the enemy.

It permits the commanding officer to control his company, enables him to extend its activity without advancing the ambulance station, and affords a reserve which is easily manipulated.

It facilitates administration and maintenance during combat by withdrawing these activities farther from the front.

It permits the use of ambulances as necessary to operate the shuttle without employment of the entire section. The remaining ambulances may then be used for specific calls or in convoy for particular situations.

Forwarding medical supplies. The ambulance section is used as an agency during combat to forward medical supplies required for current replacement by the collecting company and aid stations in its zone of action. Drivers deliver messages (informal requests) asking for supplies to the clearing station message center. The request is then delivered to the Headquarters Detachment which furnishes the supplies. These supplies when assembled are forwarded on the next returning ambulance which, on reaching the ambulance station, transfers them to the first ambulance moving forward from that station. This is repeated at each subsequent relay post until the supplies reach the collecting station. It is occasionally possible to deliver medical supplies direct to aid stations. Ambulances normally are not diverted from their prescribed routes for the delivery of supplies. This method of forwarding medical supplies is only used when the Headquarters Detachment cannot transport the supplies in its own vehicles.

Transmission of messages. It is the responsibility of noncommissioned officers and drivers to see that all messages entrusted to them are delivered with no unnecessary delays. Messages must be transferred from the driver first receiving them to the first driver moving out from the ambulance station or relay posts. The man in charge of an ambulance control point examines all messages carried by ambulances arriving at his post from the rear. If necessary, he holds the message until an ambulance passes his post going to the point addressed. Ambulances are not diverted from their prescribed routes for the transmission of messages.

Advance ambulance shuttle operation. At night and frequently during lulls in enemy activity ambulances may be used forward of the collecting station to speed evacuation of casualties. For installation of advance ambulance shuttles vehicles are brought from the basic relay post (BRP) to avoid interference with the ambulance shuttle already operating in a satisfactory manner.

Two ambulances may be operated between an aid station and the collecting station. Drivers and orderlies of these vehicles must be shown the location of the aid station to be evacuated and given forward landmarks, to prevent their movement into the area of enemy occupation. Patients are loaded into these ambulances by litter bearers of the collecting company, property is exchanged with the aid station, and patients are transported to the receiving department of the collecting station. *To speed evacuation* the following procedure has been found very successful. The driver who has just brought these patients to the rear dismounts, and his place is taken by a driver who has brought an empty ambulance forward. The patients are then driven to the clearing station by a different driver—one who has been operating in the ambulance (rear) shuttle. (This system compares with the passengers riding in the same pullman car who are taken across the United States by different engineers who transfer at various railroad terminals.) This driver transfer scheme permits the utilization of drivers



FIGURE 1. AMBULANCE SHUTTLE ESTABLISHED



FIGURE 2. OPERATION OF AN ADVANCED AMBULANCE SHUTTLE TO A BATTALION AID STATION. NOTE DRIVER EXCHANGE WHICH KEEPS EXPERIENCED DRIVERS ALONG ROUTE TO AID STATION.



FIGURE 3. USE OF AMBULANCE CONTROL POINT MANNED BY ONE ENLISTED MAN

familiar with the roads and terrain forward of the collecting station and speeds evacuation by preventing unnecessary transportation of patients between different ambulances.

A quick check at the collecting station should be made by a medical officer during the interim of exchange of drivers to observe whether any evacuees have died on the trip between the aid station and the collecting station. Should an evacuee in an ambulance moving rearward from the aid station to the clearing station be found in such condition as to render continuation of his journey beyond the collection station a poor risk, he should be removed from the ambulance at the collecting station, and given appropriate treatment. Empty space created by removal of evacuees at the receiving department should be filled with evacuees at the forwarding department, and ambulances should be dispatched to the rear only when full payloads of patients are available, unless lack of additional evacuees prolongs a reasonable delay in time of dispatch.

Disposition of empty ambulances. Upon completion of the trip to the clearing station the ambulances are returned to the *basic relay post*. The operation of vehicles at the basic relay post, and in the relay, is similar to that of taxicabs at a large railroad station or in front of a theatre at the end of a performance. The most recent arrivals take their place at the rear of the vehicular line and move out for a haul when their turn comes. Those ambulances most recently completing trips have the longest rest period before beginning the next run.

Control of ambulances at the clearing station. At the clearing station ambulances of other collecting companies, from the engineer combat battalion, and from artillery battalions will also be arriving with casualties. Much confusion may occur and in times of action property exchange may go amiss in the turmoil. Bearing these conditions in mind, during such times of duress it is sometimes desirable for a noncommissioned officer representative of the collecting company (Ambulance section) to remain back at the clearing company to check on the arrival of *his* collecting company ambulances and to check the property exchange between the clearing station and *his* company ambulances. He can also supervise dispatching of messages and medical supplies to his company, and assure delivery of messages received.

Special Operations of a Collecting Company. (1) *Retrograde movements.* In retrograde movements the immediate problem confronting the collecting company commander is to evacuate the greatest possible number of casualties in the shortest possible time. This is accomplished by advancing ambulances to aid stations, or when this is impracticable, to advance ambulance loading posts forward of the collecting station site where patients are brought by litter bearers. Another means to supplement evacuation is to utilize trucks when available. Many more patients may be hauled in trucks than in ambulances, *i.e.*: 2½-ton truck can haul 18 litter cases; 1½-ton truck can haul 12 litter cases, and a ¾-ton weapon carrier may haul 5 litter cases when wooden cross-pieces are laid between the side seats.

Patients may be hauled to the clearing station or to an entrucking point where they are transferred to army ambulances, trucks, or to other available transportation for movement to an evacuation hospital.

(2) *Night withdrawals.* To reduce litter carry at dark, vehicles are advanced as far ahead of the collecting station as the situation permits. Ambulances are usually detailed to infantry units for the movement, and after the withdrawal has begun casualties are handled as in any march.

(3) *Delaying action.* The collecting company commander assigns sufficient ambulances to support the covering force. Ambulances should be used to the fullest extent practicable in front of the collecting station. The support of the withdrawal elements will conform in general to methods described above.

(4) *Retirement.* Ambulance service is provided for the covering force or rear guard as in withdrawals. March collection is provided for the main bodies as for a march. Medical vehicles generally march between the main body and the rear guard. Evacuation is accomplished by parallel roads and during halts when practicable.

Relief of a Collecting Company at Station. When a collecting company at station is to be relieved, the commanding officer of the relieving collecting company will bring his key personnel forward and, accompanied by the commander of the company in



Figure 1. A 2½ ton cargo truck loaded with 18 litter patients.



Figure 2. A 1½ ton cargo truck loaded with 12 litter patients.

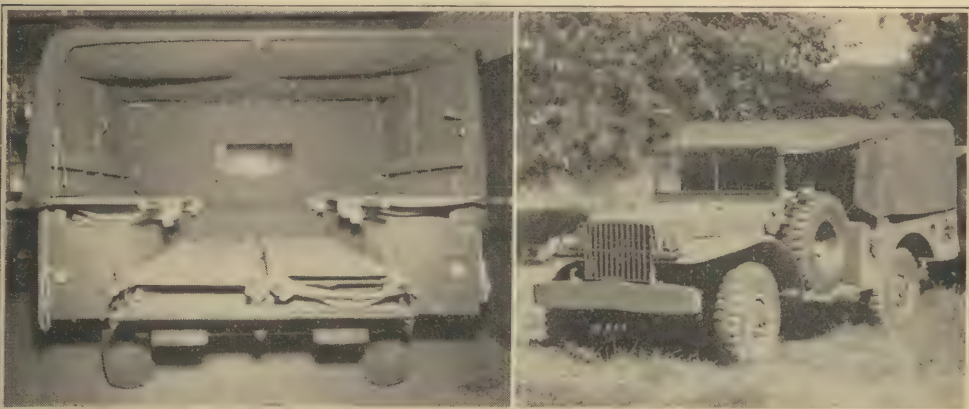


Figure 3. A ¾ ton weapon carrier, showing how 4 litters may be carried. (If 2x4 lumber is placed across the seats a fifth litter may be carried.)

Plate 14. Utilization of Trucks for Emergency Evacuation of Patients.
(See Chapter VII, Part III)

operation, will make a reconnaissance of the area of operation. He will note the location of the collecting station, aid stations supported, litter routes, ambulance relay posts, and basic relay post. Local orders and maps are transferred. The relief is effected at the time and by routes prescribed in orders. Casualties in process of evacuation at the time of relief should be transferred to the relieving organization at the time of the relief.

Employment of the Clearing Company

Introduction. Clearing is the process of disposing of the casualties of a division or comparable unit. It consists of sorting all casualties of the unit, returning to duty such as are immediately fit for full duty, and transferring all others, except the dead, to a medical unit of a higher echelon. *It is not to be confused with hospitalization.*

A clearing unit is necessary to complete the service rendered by other units of the medical service of the division. Collecting stations are located too near the front to permit their being equipped for the thorough treatment of shock or for the preparation of patients for extended evacuation. Nor can there be operated at collecting stations the clerical force necessary in the preparation of reports and returns required by the commander, or individual records of patients.

A clearing unit is primarily a combat organization. Its principal function in combat is to operate one or more clearing stations at which casualties are received, sorted, given temporary care and emergency treatment. It also completes individual records of patients.

A clearing unit is primarily a combat organization. Its principal functions is to operate in combat one or more clearing stations at which casualties are received, sorted, given temporary care and emergency treatment, and when indicated, prepared for further evacuation and transfer at the clearing station to a medical unit of a higher echelon, usually an ambulance unit of the army medical service.

A *clearing station* is an installation established by a clearing unit for the purpose of discharging the functions of clearing or *triage* (sifting). Accordingly, casualties received are sorted and classified as follows:

- (1) Those who require prolonged care and are fit for immediate evacuation.
- (2) Those requiring prolonged care but needing immediate treatment before evacuation is possible.
- (3) Those who are probably returnable to duty within a few hours—the number depending upon the necessity of keeping the clearing station free for movement.

In an infantry division the *clearing station* is the rearmost installation of the division medical service. It is essential that *all* casualties from the infantry division *pass through* the clearing station to insure that no casualties are evacuated from the division area who should be returned to their organizations for duty.

There are *no ambulances* in a clearing company. Inasmuch as no vehicles are available to move patients, the number of patients at the clearing station is held to a minimum in order to keep the clearing station free to move on short notice.

The functions of a clearing station are similar to those of a collecting station. The principal difference between the two installations is that because of more elaborate equipment and a more favorable location, the clearing station is able to undertake slightly more elaborate treatment and measures essential to further evacuation of casualties than are impracticable or impossible in a collecting station.

Unlike the commanders of other subordinate elements of the division medical service, the duties and responsibilities of the clearing unit commanders are restricted largely to the *establishment and operation of the clearing station.*

Equipment of a Clearing Company. A clearing company of an *infantry* division is equipped to care for 230 litter patients and at least as many ambulatory patients simultaneously. Such a company has two platoons, and each platoon—the basic unit—can care for 115 litter and as many or more ambulatory patients at the same time. Although designed for the care and treatment of all classes of casualties, particular provisions have been made for the needs of emergency surgical cases.

Although major surgery in combat will be cared for primarily by mobile surgical

hospitals or motorized evacuation hospitals, provisions are made in the clearing company for needs in the treatment of emergency surgical cases when these more elaborately organized units are not available for immediate support. Instrument sets, including thoracic, craniotomy, laparotomy, and orthopedic instruments, are rolled in canvas containers and packed in standard medical chests.

A number of chemical heating pads are carried as substitutes for other forms of heat in the treatment of shock, although a limited number of hot water bottles are available. There are also 2 auxiliary gasoline powered electric lighting plants, with surgical lamps, electric light bulbs, and sufficient wire to install electric lighting in buildings or tents, should commercial current not be available. All equipment and articles of medical supply are packed in standard containers and consist basically of multiples of standard medical department field equipment, specialized equipment, and miscellaneous supplies.

In each platoon there are 15 canvas folding cots and 100 litters. This gives an aggregate of 30 cots and 200 litters in the company. There is sufficient metal mess equipment in the company to feed simultaneously about 100 evacuees. Since most walking wounded and many litter wounded will have their own mess equipment with them, mess equipment for these personnel will be no problem.

The transportation of a clearing company, medical battalion (T/O 8-18) is extremely limited. With such a small number of vehicles and trailers, the problem of transporting the clearing company equipment and personnel will probably be solved by one of the following methods, or by a combination thereof:

- (1) Equipment transported on trucks and trailers, and personnel walk.
- (2) Equipment transported on trucks and the personnel scattered throughout the remainder of the battalion, especially in ambulances of the collecting companies, for movements of the medical battalion as a whole.
- (3) Shuttling one entire platoon including equipment and personnel, with the combined transportation of the entire company. This method is especially useful when one platoon is functioning at station, and the other platoon is being displaced or "leap frogging" the operating unit.

Employment of the Clearing Company. The clearing company is an integral part of the medical battalion. Its technical and tactical employment rests, therefore, with the medical battalion commander.

The clearing company renders no medical service while marching. When large bodies of troops of the division are marching it is necessary to provide temporary professional care for the sick and injured. This is usually accomplished in march camps by the establishment of one of the clearing platoons *at station*.

On the March. A clearing company (platoon) is *at station* when it is established and ready for operation. When command marches, and other professional care is not available, a clearing platoon remains at station for the reception of march casualties until the platoon accompanying the division troops has established station at the new bivouac. In retrograde movements, clearing stations should be evacuated before the command marches, and subsequently employed according to the tactical situation. When the company is split, that is, when it operates the two platoons independently, there is sufficient personnel and equipment in company headquarters to permit the operation of two messes, and each platoon may mess independently of the other.

In Combat. When combat is imminent, one or both of the platoons of the clearing company are established at station within the division zone of action. If one platoon only is established, then the other is initially held as a reserve. The number of casualties received, and the rapidity of the advance of the combat troops will determine the subsequent use of the reserve. In mobile warfare it may be necessary to move clearing stations daily or oftener. However, clearing stations are not moved as frequently as the collecting stations of the division.

The Station. Regardless whether the company is operating as a whole or as two platoons, the equipment of the company is grouped for operation into an admission department, a walking wounded, a litter wounded, and a forwarding (evacuation) de-

partment. There is also a shock section, a waiting section, and of course the usual sanitary installations and a kitchen.

In the plan of operation for such a company it is essential that an orderly plan for admitting, sorting, treating, recording, and evacuating patients be involved. Provisions must be made for expanding the unit, with utilization of both platoons of the company, or for the cooperative action with other clearing companies, such as those sent as reinforcements from army medical regiments or GHQ gas treatment battalions.

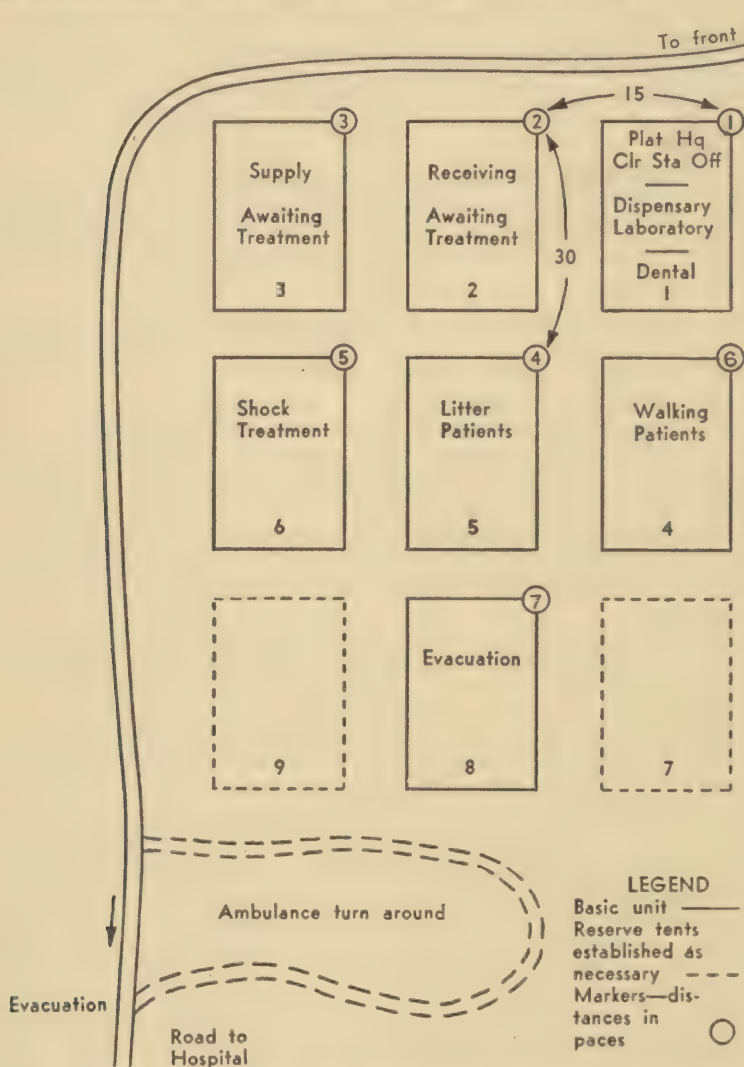


Plate 15. A Ground Plan for Clearing Station, Infantry Division.

It is essential that systematic methods which have speed and precision be developed in order that unloading and loading of equipment from and on trucks and trailers be accomplished without delay, that pack and unpacking of equipment and supplies be done with dispatch, that officers and men know how to install the various units of equipment, and that personnel be trained in the erection and striking of the large ward tents. Such training should be initiated and carried out by means of a company SOP. This procedure will eliminate many oral orders and detailed instructions. It will be extremely helpful when operating under duress.

The apportionment of personnel shown in T/O 8-18 is based on the duties which must be performed in order that the unit may perform its combat service functions. Flexibility within the organization is necessary and demands the shifting of personnel from one duty to another as circumstances require. It is a function of the company commander to train personnel by temporary interchange in departments so that emergencies can be met successful without undue embarrassment.

Location of a Clearing Station. Obviously a clearing station cannot be set up at a place without consultation and authorization. Inasmuch as the clearing station is a division medical installation, it comes under the jurisdiction of the General Staff Officer, G-4. Through an exchange of opinions between the division surgeon and the medical battalion commander, recommendations for the location of the clearing station area are made to G-4. Should G-4 approve the area for location of the clearing station, the location will be announced in the Division Order.

After learning of the approved location for his clearing station the company commander definitely locates the site of the station by an actual reconnaissance of the ground. Premature establishment of the station, or selection of an undesirable site are to be avoided, as the station is relatively immobile. The tactical situation and all of the following factors should therefore be considered before a clearing station is established.

Necessary

A location on or near a serviceable road on the route of evacuation between collecting stations at the front and evacuation hospitals in the rear.

A space large enough for the complete station.

Desirable

A location 4 to 7 miles from the battle front outside the range of hostile light artillery.

Safety from observed long range artillery fire.

Buildings that can be used.

Central location within the division sector or zone of action.

Water supply.

Soil well drained, level, firm, and free from rocks or large stones.

Undesirable

Location in immediate proximity to crossroads, main roads (liable to interdiction), dumps, and artillery positions.

Heavily wooded areas.

Soil that is rocky, swampy, or that contains an excess of sand or clay.

Ground plan. The clearing station establishment is divided into the following areas, all of which must be concealed:

(1) Clearing station proper. The area must be large enough to establish the equipment normally necessary to care for the varied types of cases that arrive at the station.

Additional area for expansion or establishment of entire station. *Concealment is paramount.* The Geneva convention rules of warfare are observed by our troops, but newspaper accounts of action against certain enemies reveal that these rules are not always respected and little or no protection of our medical installations can be expected. *Medical installations indicate to the enemy very useful tactical information relative to the strength of our forces.*

(2) Transportation area. The transportation area may be some little distance from the station proper, in order to obtain adequate concealment. Dispersion also is employed to minimize the losses of vehicles from a single shell or bomb.

(3) Personnel bivouac area. Here again concealment, dispersion, and protection are absolutely necessary.

(4) Kitchen area. This area should be located convenient to the basic unit and also to the personnel bivouac area, but above all must be concealed.

(5) Sanitary installations. No fixed rule can be set for the location of these installations, however, again *concealment* is to be stressed, and secondly convenience to the patients and troops, observing necessary principles of sanitation.

Variations in ground plans. Variations in the establishment of a station are the rule.

Gone is the day when a clearing station may be set up with tentage alined like a circus on location, either for ease of care of patients or for military precision and show. The entire installation must be fitted to the ground available in the best possible manner to obtain cover, concealment, defilade, protection from mechanized and armored threat, and still function in an efficient manner.

Existing buildings. Existing buildings often provide all of the requirements admirably. Small towns and villages offer excellent, concealment, buildings offer shelter, plumbing facilities may be present, and public buildings such as schools, municipal halls, and county courthouses with large rooms and large doorways will be utilized to the fullest possible extent.

Operation of a Clearing Station. The basic unit, whether set up *without shelter*, in existing *buildings*, or under canvas, usually consists of the following departments:

- (1) Headquarters (platoon or company) for unit and patients.
- (2) Admission and sorting. Establishment of priority of treatment, filling out clearing station tag (M.D. Form 53) and sending admission section to unit office. Directing movement of wounded to proper section for treatment. Sorting (triage) is essential in order to prevent too many unnecessary evacuations from the division area. Once a man has left the division area it requires several days for him again to rejoin his organization, regardless of speed of his recovery; hence by preventing unnecessary evacuation from the division, the medical units assist in maintaining fighting strength.
- (3) Walking wounded.
- (4) Litter wounded.
- (5) Shock treatment.
- (6) Dispensary, and laboratory.
- (7) Dental section.
- (8) Supply section.
- (9) Kitchen for messing of both patients and company personnel.
- (10) Forwarding department—completion of emergency medical tags, removal and completion of disposition tag (M.D. Form 53) and property exchange with vehicles evacuating the station to the rear.

(x) When gas casualties arrive and no other unit is adjoining the clearing station is available to treat them, personnel of the clearing station must initiate treatment utilizing the gas casualty treatment sets. When handling casualties suffering from persistent chemical agents, protective clothing and gauntlets must be used by medical personnel in addition to their gas masks.

Records. A record is made of every patient admitted and every patient disposed of, whether returned to their organizations, evacuated to the rear (usually by army ambulances) or who dies in the station. Consolidation of the admission and evacuation records gives an accurate indication of the number of men out of action, and this may be the best and the most accurate picture the division commander can obtain, relative to the actual casualties sustained by his division.

Accurate records are essential. For simplicity, a medical department form, *Clearing Station Tag M.D. Form 53* is used in the clearing station. Its purpose is to facilitate the handling of records connected with the admission and disposition at clearing stations. An individual tag (M.D. Form No. 53) is initiated for each patient admitted.

This tag is composed of two sections. Both sections are initiated in the receiving department of a clearing station. To speed the preparation of these tags an *imprinting machine* is used. This machine prints information directly from the identification tags worn about the necks of all military personnel. The machine is adjustable as to selection of lines to be printed. Only the two uppermost of the five embossed lines of the identification tag are required for reproduction on the clearing station tag. When used in a clearing station, the imprinting machine is adjusted to print the upper two lines only.

The man designated to initiate the M.D. Form 53 at the receiving department places the casualty's identification tags in the imprinting machine and prints the casualty's name as serial number in the appropriate spaces of *Section B* and *Section A* of the form.

If obtainable, the grade and organization are printed in the spaces provided for this information, and the abbreviation for the diagnosis is placed in the designated spaces

This information is placed on both section A and section B. In addition, the month, day, year, and time are placed on section A—admission.

Section A, upon completion, is torn from section B at the perforation marks and is sent to the clearing station office.

Section B is attached to a button of the patient's clothing and remains with him till he reaches the disposition clerk.

SECTION D		DISPOSITION		INSTRUCTIONS: THIS TAG IS FOR USE IN CLEARING STATIONS.		
NAME—A. S. NO. ROY E. DIVELY 6065920 T42		GRADE Pvt 1cl		<p>ON ADMISSION ENTER ALL INFORMATION ON "BOTH" SECTIONS EXCEPT UNDER "REMARKS" AND "DISPOSITION". TRAUMATISM DIAGNOSIS WILL BE ENTERED BY USE OF ABBREVIATIONS AUTHORIZED IN PAR. 50, FM 8-45. IN CASE OF ILLNESS OR GASSING, "SK" OR "GAS" WILL SUFFICE. INJURIES SHOULD INDICATE PART OF BODY INVOLVED AS: HEAD, BACK, CHEST, ABDOMEN, UPPER EXTREMITY, ETC., E. G.,</p> <p>(1) GSW - S - PEN - CHEST.</p> <p>(2) MW - S - HEAD, CHEST, UPPER EXTR.</p> <p>(3) FCC - LOWER EXTR.</p> <p>SECTION "A" WILL BE DETACHED AT ONCE AND SENT TO OFFICE.</p> <p>SECTION "B" WILL BE ATTACHED TO PATIENT'S CLOTHING WHILE IN THE CLEARING STATION. AT TIME OF DISPOSITION, COMPLETE THIS SECTION, E. G., DISPOSITION:</p> <p>(1) DIED, OR (2) DUTY, OR (3) SURG. HOSP. -6.</p> <p>AND SEND SECTION TO OFFICE.</p> <p>DESTROY BOTH SECTIONS WHEN OFFICE RECORD IS COMPLETED.</p>		
DIAGNOSIS (ABBREV.) GSW - Pen - Chest		ORGANIZATION Co M 39 Inf				
REMARKS <i>Hold for Evac. Hosp #9 JCB</i>						
DISPOSITION EVAC #9	MO 11	DAY 3	YR 42	AM 0530	PM	
SECTION A—ADMISSION						
NAME—A. S. NO. ROY E. DIVELY 6065920 T42		GRADE Pvt 1cl		<p>Form 53 MEDICAL DEPARTMENT, U. S. A. (Authorized May 21, 1942)</p>		
DIAGNOSIS (ABBREV.) GSW - Pen - Chest		ORGANIZATION Co M 39 Inf				
ADMITTED						
		MO 11	DAY 2	YR 42	AM	PM 2300
CLEARING STATION TAG SEE INSTRUCTIONS ON BACK						

Plate 16. M.D. Form No. 53.

As admission sections are received in the office they are arranged systematically to await arrival of the disposition sections. The record clerk using plain paper prepares a check list in duplicate similar to the form shown in Plate 16.

On the rear of the tag are instructions to destroy both sections of the tag when office record is completed. This instruction is not obligatory if in the surgeon's opinion the completed sections have further value, as, for example, in forwarding all "disposition" sections daily with check list to the division surgeon. However, since the check list contains all of the information shown on form M.D. 53, it is duplication of effort to have both sets of information forwarded. Section II, W.D. Cir. 182, dated June 11, 1942, has reference to entries on M.D. Form 52b (EMT), the result of which will be that all casualties received by a clearing station in combat will have incomplete FM Tags. The missing information should be entered at the clearing station, if obtainable. It is desirable to place this information on tags at the receiving departments, for many



Plate 17. Printing Evacuee's Name and Army Serial Number on M.D. Form No. 53 by Means of Imprinting Machine. (Tetanus Toxoid Date and Blood Type Also Shown).

CHECK LIST OF SICK AND WOUNDED

Station Co D, (Clr), 10 Med Bn

0001 Nov. 3, 1942
Period covered 2400 Nov. 3, 1942

Name	A.S.No.	Grade & organization	Diagnosis	Adm. date & hour	Disposition	Date & hour
Dively, Roy E.	6065920	Pvt 1 cl Co M 39 Inf	GSW, Pen Chest	2 Nov 42: 2300	Evac No 9	3 Nov 42 0530
Welton, Samuel S.	0-82167	Capt 40 FA	Pneu- monia Lobar	3 Nov 42: 0110	Evac No 9	3 Nov 42 0530
Zellar, William T.	30123456	Corp Co B 39 Inf	EW Abdom- en	3 Nov 42: 0600	Died	3 Nov 42 0630
Weiss, Jack (None)	33072201	Pvt Co A 10 QM Bn	FS 5 Met- acarpal, Left	3 Nov 42: 0635	Returned to duty	3 Nov 42 0730

Plate 18. Check List of Sick and Wounded (Clearing Station).

patients may lose consciousness before the forwarding department is reached. Because of activity at the receiving department this information may not be completed. All EM Tags should be checked at the forwarding department and information completed if obtainable.

Section B accompanies the patient through the clearing station. A space "remarks" is provided for use in the station. When the evacuee arrives at the forwarding department the disposition section is completed, giving the place of disposition, the month, days, year, and the time; and section B is then sent to the station office where the information is used by the station clerk to complete the *check list of sick and wounded*.

No other records are required of clearing stations.

Contact. The only normal direct contacts of a clearing station are with the ambulances of collecting companies to the front, and with the ambulance units of higher echelons in the rear. In each case the responsibility for contact rests with the ambulance units whose disposition and movements must conform to those of the clearing station.

Evacuation of a Clearing Station. The arrangements for evacuation of a clearing station are the responsibility of the division commander, but this is usually arranged for by the division surgeon through G-4, or directly by the division surgeon himself.

When the division is operating as part of an army, arrangements of evacuation of clearing stations are made through army G-4 (or directly with the army surgeon). When the division is operating as part of a smaller unit, the G-4 of the unit headquarters (or directly with the surgeon of the unit) is contacted for evacuation of the clearing stations.

Supplementary Units. Frequently during heavy engagements a *surgical hospital* (Army) may be moved to the vicinity of the clearing station to take over cases requiring surgical treatment. A surgical hospital is equipped with mobile operating rooms and necessary auxiliary equipment to perform major surgical operations. The surgical hospital is equipped with a limited number of ambulances and may evacuate cases requiring urgent surgical treatment from the clearing station to its own installation. Patients evacuated for treatment by a surgical hospital are considered removed from the division, as are those evacuated by higher echelon ambulances to evacuation hospitals.

Closing Station. Usually warning orders precede actual orders to close station, and the station may be gradually dismantled and loaded until the minimum amount of equipment is employed in service to care for the few casualties within the station. At the receipt of the order to move, (assuming that all patients are being evacuated), the entire station equipment and personnel are loaded on vehicles and moved to the new location for employment as ordered by higher authority. If a few patients remain within the station they may either be moved forward on truck to the new station site, or personnel must remain back with them until they are evacuated, after which the personnel who remained with them will rejoin their unit.

Employment of the Headquarters Detachment

Introduction. The headquarters detachment is an organic part of the medical battalion. It is the *service* unit of the medical battalion, and although called headquarters *detachment* it functions as a company. It has its own company commander, first sergeant, mess sergeant, supply sergeant, motor sergeant, and clerk. It submits a morning report, and operates its own mess. Headquarters detachment has a number of important functions among which are:

Furnishes personnel to assist officers of the medical battalion headquarters.

Provides personnel to operate the *personnel section* of the battalion.

Procures and issues *all classes of supplies* to all units of the medical battalion.

Executes *second echelon maintenance* for motor vehicles of the medical battalion.

Procures and issues *medical supplies for all units of the infantry division*, in addition to the medical battalion.

Battalion Headquarters Section. Officers of battalion headquarters, and men from the headquarters detachment comprise the battalion headquarters section. The officers consist of:

Commanding officer Lieutenant colonel, Medical Corps.
 Executive and plans and training officer Major, Medical Corps.
 Adjutant Captain, Medical Administrative Corps.
 Supply officer Captain, Medical Administrative Corps,
who also functions as division medical supply officer, and is commanding officer of Headquarters Detachment of the Medical Battalion.

The men include a master sergeant (battalion sergeant major) who manages the administrative details of battalion headquarters and supervises the sergeant (message center chief), the clerk-typist, and orderlies. This section assists the battalion commander in the organization, training, and tactical employment of the medical battalion. In maneuvers and in combat they will establish the command post of the medical battalion. Since the *clearing station* is the focal point of the division medical service the battalion command post should be established in vicinity of the clearing station. Occasionally the division signal officer will establish a single telephone line to the battalion command post which will assist in maintaining contact with the division command post, and especially with the *division surgeon*.

Personnel Section. A 2d Lieutenant, Medical Administrative Corps (or qualified warrant officer), technical sergeant, and 3 clerks comprise this section. Together with the clerks of headquarters detachment, and companies A, B, C, & D, this section prepares all records, reports, payrolls, and cares for most correspondence. It maintains all personnel records pertaining to officers and men of the battalion, and generally is custodian of the service records and qualification cards for the men of the battalion.

In garrison or in camp this section generally operates as part of the medical battalion. However, in maneuvers and in combat this section will operate, mess, and bivouac with *Rear Echelon of Division Headquarters* (See Plate 1).

Detachment Headquarters Section. For all practical purposes headquarters detachment is a company. The battalion supply officer (Division medical supply officer), a captain, Medical Administrative Corps, is its commander. The men of this section perform the administration, motor maintenance, supply, and mess for the headquarters detachment, and also *operate the mess for the medical battalion headquarters*. Obviously this section cannot be located far from battalion headquarters.

Motor Maintenance Section. Motor vehicles of the medical battalion requiring repair or adjustments beyond the capabilities of the chauffeurs of company mechanics are transferred to this section. This section also makes inspections to check on the preventive maintenance executed by company maintenance sections. A second lieutenant, medical administrative corps, a technical sergeant, a sergeant, 4 mechanics, and 2 privates compose this section. In combat the focal point for medical battalion vehicles, especially ambulances, is at the clearing station, so this unit should be located in vicinity of the clearing station.

General and Medical Supply Sections. The captain, Medical Administrative Corps, who commands the headquarters detachment, is involved in 3 echelons of supply. He is interested in the supply of his detachment; he is supply officer of the medical battalion; and he is medical supply officer for the division. To assist him he has a 1st lieutenant, medical administrative corps, (or qualified warrant officer) and the following men: A technical sergeant who is battalion supply sergeant, who is not concerned with supply of the headquarters detachment any more than he is with the supply of companies A, B, C, or D. His concern with medical supply of the division, and general supply of the battalion, including equipment, uniforms, rations, gasoline, and similar necessities. He has a sergeant, a clerk, and chauffeurs to assist him.

General Supply of the Battalion.

Rations and gasoline (Class I and Class III). On maneuvers and in combat rations and gasoline are generally distributed to units of the division daily. The details of this daily distribution is enumerated in the division SOP (*standing operating procedure*). There are three ways these classes of supplies may be issued to units of the division:

(1) *Railhead distribution.* Vehicles of the medical battalion headquarters detachment are driven to the division railhead (or truckhead) and will draw rations and

gasoline allotted to the medical battalion. These vehicles will return with their loads to the headquarters detachment bivouac area for breakdown of the ration.

(2) *Dump distribution.* The same transportation must move to the Class I and Class III dumps established by the quartermaster battalion of the division. This method is used when the quartermaster trucks must unload their reserve of rations and gasoline in order to be of some other service.

(3) *Unit distribution.* The quartermaster trucks will distribute battalion rations and gasoline to the bivouac area of the headquarters detachment. (This method is not used frequently).

The headquarters detachment in turn must "break down" the rations and gasoline, in other words divide it into lots the size of which are in proportion to the company to which it is to be given. There are two general ways in which these "broken down lots" may be turned over to the companies:

(1) The transportation of the company may return to the bivouac area of the battalion headquarters detachment and pick up the rations and gasoline—*distributing point* distribution. Very frequently this may be the only sure way for a company to insure getting its daily quota of supplies. It is easier for a company to find the centrally located headquarters detachment than it is for the latter to find camouflaged collecting stations in the thick of battle.

(2) The headquarters detachment may load these items onto its own trucks and led forward by company guides these trucks will transport supplies forward to the company kitchens and motor vehicles.

The time of distribution of supplies at the railhead, truckhead, or dump is published in division SOP, or SOP as modified in the division administrative order. This latter document will also specify the type of ration to be distributed, *i.e.*: A, B, C, D, K, etc.

The time for distribution of supplies by the medical battalion must be decided by the battalion commander, usually upon recommendations of the battalion supply officer. Because of air activity, most movements of supply vehicles will be at night and under blackout conditions. Such precautions will greatly impede the breakdown of rations and gasoline by the general supply section of headquarters detachment.

General and Medical Supplies in Garrison or Camp. This subject is one requiring detailed explanation. It is covered in Chapter X. Briefly it consists of the headquarters detachment consolidating company requisitions, forwarding the approved consolidated requisitions, drawing the supplies in bulk and redistributing them in accordance with original company requisitions. A similar method is employed for medical supplies.

Medical Supply in Combat. Since *speed in combat* is essential, a requisition in the field may consist of a pencil notation of what is wanted by a unit. In garrison and in training units must follow the usual channels of securing medical supplies. In combat medical supplies for an infantry division are secured in the following manner:

Headquarters detachment reserve—approximately 3 days of medical supplies for a division are carried. (Based upon experience tables World War I.)

Medical supply dumps—generally established in vicinity of evacuation hospitals.

Medical supply depots—occasionally forward far enough to be within reach of headquarters detachment transportation.

Daily train—(railhead)—provided a requisition has been submitted well in advance, and time lag for requisition and distribution channels is considered.

Medical service of a division is the responsibility of the division commander. He relies upon his division surgeon to keep him informed as to the medical service. Medical supply is extremely important to efficient function of this service. It is highly improbable that requisitions, however urgent, would be dispatched without consultation of the division surgeon. Although not following the usual chain of command, it is likely that the division medical supply officer would deal directly with the division surgeon in manners pertaining to medical supply, keeping his battalion commander informed constantly of his actions. No prescribed methods of procedure are prescribed, but with all probability, many details of such action may be formulated during

the initial training periods of an infantry division, and a SOP written to the satisfaction of all parties concerned.

Distribution of medical supplies. In combat medical supplies are requisitioned in a manner designed to expedite both requisition and delivery. The systems involved should be simple and flexible. Each medical unit, from attached medical units up through the headquarters detachment of the medical battalion carries a small reserve. The reserves of the attached medical units will naturally be first depleted in action. Attached medical units may requisition directly on the division medical supply officer by informal memorandum (a slip of paper bearing organization designation and a list of articles wanted), and may call for them in one of their own vehicles. There is little likelihood of such units having supplies delivered to them by headquarters detachment in combat. Another very satisfactory method of securing supplies is for detachments to call upon the collecting company evacuating them. Supplies may be requested by written message and delivered by litter bearers on their trip forward to evacuate the aid stations. Likewise collecting companies may send a messenger back by motor vehicle or in an ambulance to obtain medical supplies. These supplies may then be delivered by a detachment truck with the messenger as a guide, or more probably by returning ambulance. However, when supplies are returned by ambulance it should be remembered that ambulances are operating as part of a shuttle, and chauffeurs are trained to return to the *basic relay post* upon completing a trip to the clearing station. The officer or noncommissioned officer in charge of the basic relay post should routinely check each vehicle reporting to the basic relay post for any supplies or messages that are brought forward. When such items are found in vehicles it is a simple matter to dispatch these articles forward in another vehicle, or to avoid delay at relay posts forward simply transport them forward in a small vehicle ($\frac{1}{4}$ -ton truck) generally loaned to the ambulance section for checking operation of the shuttle.

MEDICAL SERVICE WITH ARMORED FORCE (FM 8-5)

Employment of Armored Units. For the tactics and technique of the employment of units of the Armored Force see FM 17-10.

Characteristics of employment of medical units with armored force. Because of the high mobility of Armored Force units the establishment of medical installations is difficult and limited. Higher units must evacuate wounded at once as the units below the armored corps will have no hospital facilities.

The combat zone of armored units is deep. Fighting will often be extremely confused and the establishment of definite front lines not only difficult, but unusual. The movement and establishment of installations of unarmored units frequently will be impracticable.

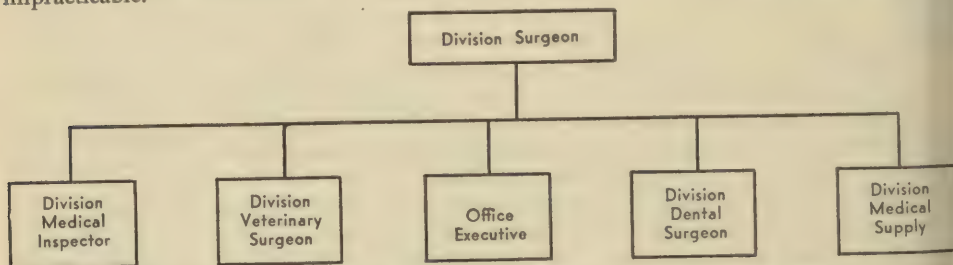


Plate 19. Organization of Division Surgeon's Office, Armored Division.

The number and type of casualties will vary in different components of the Armored Force. A standard evacuation system cannot be applied to each unit.

Tank casualties will probably be less than infantry casualties as such troops are protected from small arms fire and shell fragments. Tank casualties will be due to blasting effect of mines, resulting in fractures of the lower extremities; minor wounds caused by bullet splash and fragmentation inside the tank; and fatal wounds caused

by projectiles of larger caliber penetrating the tank. Severe burns may also be received from vehicles set on fire. It is estimated that total casualties among tank personnel will normally be about 5 per cent and that 4 per cent will be fatal. Casualties in particular actions may run extremely high. In combat in Africa, casualties in certain units have run as high as 30 per cent in one battle day.

Armored infantry are vulnerable to air attack, even when mounted in armored personnel carriers. When dismounted they will be as vulnerable as any other dismounted troops. They will usually suffer higher casualties than troops in tanks.

Owing to the demand for close support, casualties in artillery troops will be higher proportionately than in artillery supporting other arms.

Casualties in reconnaissance troops may be high. There can be no set plan for evacuation of such casualties and they must be carried with the unit until other troops close on the reconnaissance units.

The mortality rate among abdominal and brain cases will be definitely affected by the rate of evacuation to medical installations affording definitive surgical treatment. Forward elements should have sulfathiazole and sulfaguanidine. Medical personnel must be well trained in evacuation of wounded from tanks. They must be taught how to open and get into tanks. They must at times depend upon maintenance personnel to open the doors of the tanks for them.

Support of Armored Force Medical Units. Medical units of higher organizations must be prepared to evacuate the wounded from armored divisions and GHQ reserve tank units. The medical regiment attached to the armored corps assists in evacuation from division collecting points. Armored divisions and GHQ reserve tank units attached to army corps depend upon the medical regiment of that corps for assistance. When an armored division is sent on an independent mission its medical battalion should be appropriately reinforced.

Division Surgeon. The division surgeon is a member of the division commander's special staff, is the technical advisor on all matters relating to sanitation and medical service, and is responsible for the technical training of all medical personnel of the division. His duties are administrative. He has no command functions. Any orders given by him are in the name of the division commander. Plate 17 shows the organization of the division surgeon's office.

The division surgeon's office will usually be established at the rear echelon of the division command post. However, the division surgeon will make visits to the forward echelon as necessary. He must maintain liaison at all times with medical elements of the forward echelon of division headquarters and with supporting medical units.

In order to make plans for employment of the medical battalion and to provide for adequate medical support from higher units, it is essential that the division surgeon be given timely warning of the division commander's plans.

THE ARMORED MEDICAL BATTALION, ARMORED DIVISION

The armored medical battalion is a flexible, highly mobile unit capable of accompanying combat elements of the armored division. It is composed of a battalion headquarters and headquarters company and three medical companies. It is commanded by a lieutenant colonel.

Employment. The medical battalion is organized so that it may function as a unit or elements may be attached to tactical groupings of the division. On the march, one medical company will usually be attached to each combat command and the other company to the trains, but will be available to the battalion commander on call. Medical companies march at the rear of the columns. Medical personnel and ambulances may be attached to advance, flank, and rear guards and to reconnaissance detachments.

Headquarters and Headquarters Company. The headquarters and headquarters company is organized as shown in Plate 18. This company is organized for administration, supply, and maintenance of the medical battalion. It also furnishes medical supplies for the unit medical detachments.

Medical Company (Armored). There are three medical companies (armored) in the medical battalion. They are so constituted as to be self-contained, are as mobile as any other element of the force they accompany into action, and assure prompt medical care and evacuation of forward units. Each company has a company headquarters consisting of command, maintenance, administration and supply, and mess sections,

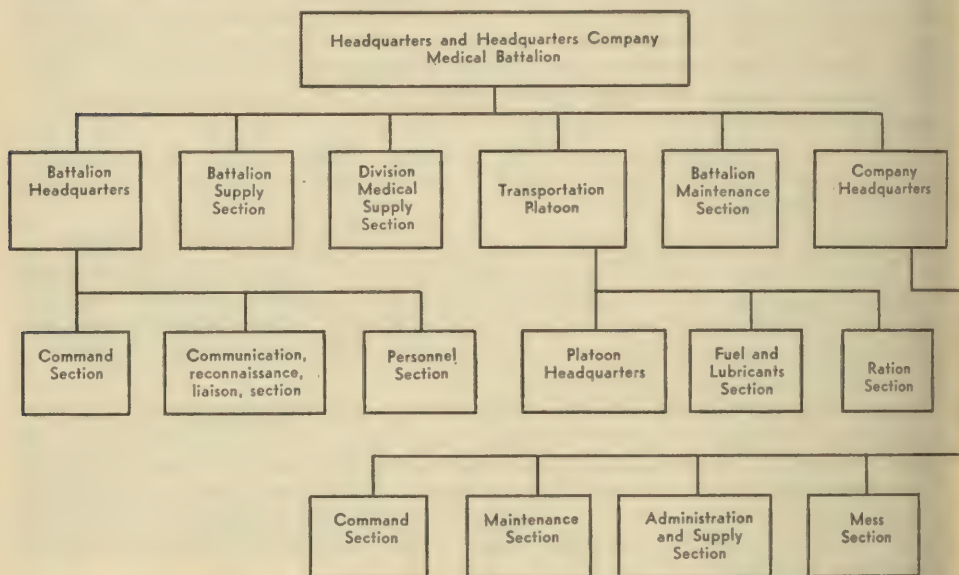


Plate 20. Organization of Headquarters and Headquarters Company, Medical Battalion (Armored).

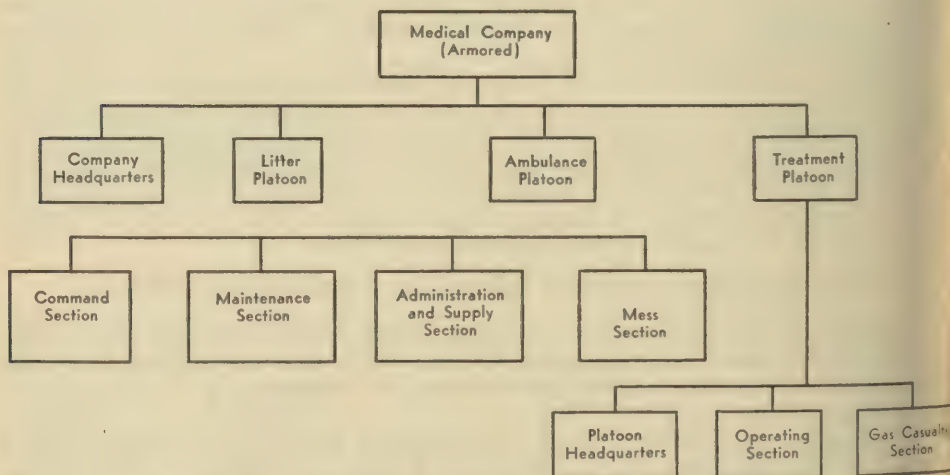


Plate 21. Organization of Medical Company (Armored).

a litter platoon, an ambulance platoon, and a treatment platoon. The commanding officer of this company has his command post in a $\frac{1}{2}$ -ton carry-all. This vehicle has an SCR-528 radio set which can be set on the division net, medical battalion net, or the net of the unit to which attached. His maintenance section has mechanics and a $2\frac{1}{2}$ -ton truck, wrecker, and is capable of first and second echelon maintenance. The administration and supply section maintains pertinent records of sick and wounded and

is concerned with property exchange and medical supply. The mess section is adequate to furnish food for the company personnel and wounded.

Litter Platoon. *Personnel and transportation.* This platoon is commanded by a lieutenant, Medical Administrative Corps; he is assisted in his duties by noncommissioned officers. The privates in the platoon act for the most part as litter bearers. The transportation includes a number of trucks, one of which is equipped with a radio (see appropriate T/O and T/BA for details).

Operation. The fluid nature of armored operations makes it impracticable to establish battalion and regimental aid stations in the orthodox manner. This is particularly true of the armored regiments. It is contemplated that litter bearers will be employed in the evacuation of battalion and regimental mobile collecting points established by their respective attached medical personnel as they follow up the units they service. With the armored half-track, capable of carrying four litter cases, they are capable of operating in areas otherwise denied them. The $\frac{1}{4}$ -ton truck permits approach to isolated cases by utilizing terrain features and can evacuate two to four litter cases (when equipped with hood brackets). The $2\frac{1}{2}$ -ton truck may, under certain conditions, be utilized in the evacuation of casualties, as they carry 18 litter cases. Evacuation by the platoon will normally be to the mobile collecting station established by the operating section of the treatment platoon. By means of its radio, this platoon maintains contact with all elements of the striking force it is serving. The most difficult problems will be presented in the treatment and removal of wounded from a disabled tank. Special arrangements and training for the removal of wounded from the tank turret and escape port must be provided.

Ambulance Platoon. This platoon is commanded by a lieutenant, Medical Administrative Corps. He is assisted in his duties by noncommissioned officers. The privates in the platoon act for the most part as ambulance drivers and ambulance orderlies. The transportation consists of a few small trucks, one of which is equipped with a radio. It functions as a platoon or as two self-contained sections. This platoon is used to evacuate forward areas if the situation permits, and will usually evacuate to the mobile collecting station established by the treatment platoon. With a view to maintaining the full complement of ambulances in the forward divisional areas and expediting evacuation, a shuttle system with the corps medical regiment ambulances must be established. At a predetermined point in the evacuation chain, arrived at by agreement with the corps surgeon, a designated corps ambulance is made available to the contacting division ambulance driver. The corps ambulance driver completes the evacuation of division evacuees to the mobile hospital station, while the division chauffeur takes the corps ambulance into the forward divisional area. The advantage of this transfer of ambulances lies in the fact that the division ambulance driver is familiar with the tactical situation and knows the location of the units he is servicing. With this system the delivery of medical supplies from the corps to the division is expedited and property transfer is facilitated. Hazards of air strafing or indirect harassing or interdiction artillery fire are lessened as there is in the evacuation system no delay otherwise occasioned by transfer of patients from one ambulance to another. This system has the added advantage of reducing the handling of seriously wounded men to the minimum. Radio contact with all elements of the division is available to this platoon.

Treatment Platoon. The treatment platoon consists of a *platoon headquarters*, an *operating section*, and a *gas casualty treatment section*. The *platoon headquarters* has 1 first lieutenant, Medical Corps, 1 platoon sergeant, and 1 private (chauffeur). It is transported on a $\frac{1}{2}$ -ton (carry-all) and maintains contact with other elements by radio.

The *operating section* of this platoon has as its personnel 4 first lieutenants, Medical Corps, 1 first lieutenant, Dental Corps, and 18 enlisted men. Its equipment and personnel are carried on two $2\frac{1}{2}$ -ton 6 x 6 trucks. It has in addition a special operating room body mounted on a $2\frac{1}{2}$ -ton truck chassis, with necessary surgical equipment, and a bus or panel type body likewise built on a $2\frac{1}{2}$ -ton 6 x 6 truck chassis. This section establishes in combat what was formerly called the collecting station. It is the nucleus of the medical battalion in that all activities of the battalion radiate from its center

in both directions. Its mobility and the maneuverability furnished by the $2\frac{1}{2}$ -ton 6 x 6 truck chassis permit employment well forward. It will be established along axis of evacuation of the force it supports and will usually operate in the rear of artillery. It can readily meet conditions imposed by a shifting of the evacuation axis. It has facilities for rendering adequate emergency surgical care, including blood transfusions, at a time when such procedures are most effective. When the combat mission of the division results in disruption of lines of communication, this section can continue to function. It is conceivable that under certain conditions wounded will be conveyed to the rear. Evacuation of advanced elements will be to the collecting and treatment station established by this section. Here wounds will be redressed, splints applied or adjusted, morphine and tetanus toxoid administered, emergency surgical measures employed, and the patient reacted from shock and prepared for evacuation to the rear. No predetermined operative procedure can be elaborated that will satisfactorily meet all tactical situations that may confront the armored division. Intimate control, intensive personal supervision, and marked initiative are the essentials for efficient functioning of all elements of the medical battalion.

The *gas casualty treatment section* is equipped to treat gas casualties in the forward area if and when the enemy resorts to the use of gas. When not employed for this purpose, it augments the operating section. It is equipped with an operating room body on a $2\frac{1}{2}$ -ton, 6 x 6 truck chassis and has a bathing pavilion and clothing exchange section. It usually accompanies the operating section into action, but may function independently. It is so constructed that it may serve the same purpose as the mobile surgical truck.



Plate 22. Surgical Truck (Operating Room) with Armored Medical Company Treatment Platoon.

In the establishment of the collecting and treatment station, concealment and camouflage must be employed. Direction signs must be placed along the line of drift, well forward to indicate its position.

Since this station is usually established at night, careful reconnaissance by the medical company commander and an officer of the platoon is essential. Guides must be posted and all security measures observed.

Evacuation of these stations by air may not be practical. Air evacuation assumes control of the air by friendly forces and suitable landing fields. For these reasons air evacuation may often be limited to areas adjacent to evacuation hospitals.

Medical Supply, Communication, and Liaison Armored Units. Supply in action. The battalion distribution point for medical supplies is usually established near the forward command post of the division. However, in combat, the supply officer establishes dumps in the forward area. These dumps may be on the ground, but preferably are in $\frac{3}{4}$ -ton trucks. One dump must be in the vicinity of the collecting station where supplies of the regiment and battalion detachments may be replenished, and one dump is established in assembly areas immediately prior to attack. Considerable amounts of medical supplies must be kept well forward on wheels during combat with the supply section of the medical company. The division medical supplies are kept in trucks near the rear echelon of division headquarters where the division is committed. Division medical supplies are replenished by the corps. Dumps should always be so dispersed that enemy fire will not destroy all of them. In all field units of the medical service of the armored division there is automatic exchange of nonexpendable items of equipment. In combat, expendable medical supplies are obtained by informal requisition from the next higher medical unit. Unit delivery will be made by $\frac{1}{4}$ -ton pick-up truck, $\frac{3}{4}$ -ton truck, or ambulance. Under certain conditions, delivery of medical supplies to isolated units may have to be made by parachute. For this purpose, a dressings unit, splint unit, and blanket unit should be packed in a reinforced canvas bag the size of a mail bag, weighing not to exceed 60 pounds, as all three units could be delivered by one parachute.

Class I items will be handled in the manner usually employed for other battalions of the armored division. The transportation platoon draws class I supplies at the division ration dump and gas distributing point and breaks them down for delivery to the individual medical companies. A complete refill of gasoline must be maintained in the combat train of each combat command.

Communication and liaison. The responsibility for the establishment and main-

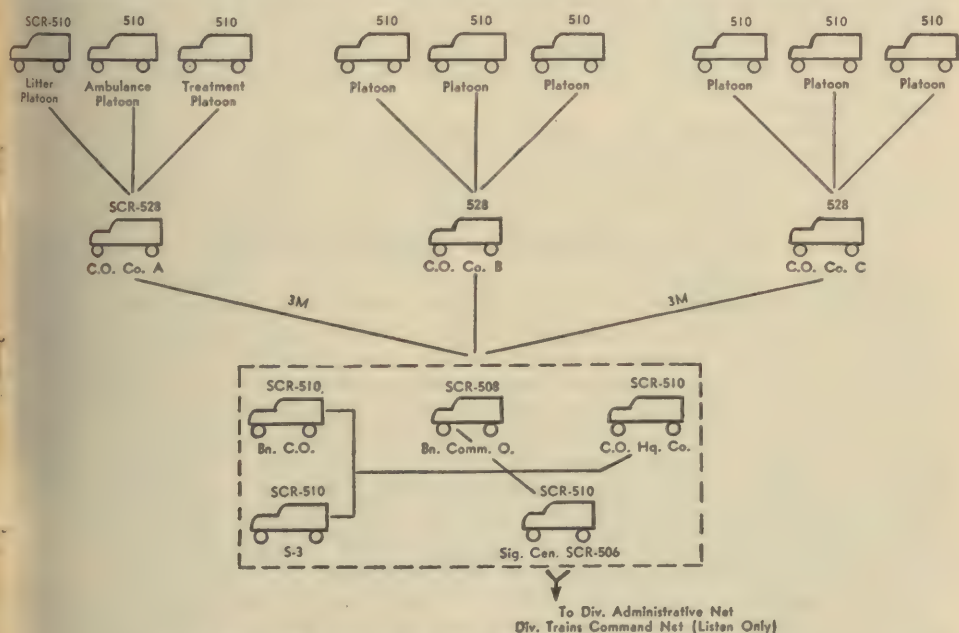


Plate 23. Radio Net, Medical Battalion, Armored Division.

(Notes: A medical company attached to another unit will change to that unit's frequency. When one company is with the trains, the battalion commanding officer will usually have to transmit messages to it through division command channels. All radio vehicles are $1\frac{1}{2}$ -ton carryalls. Dotted lines indicate "physical contact.")

tenance of liaison is a command responsibility of the battalion commander. He discharges this function through the *command*, *reconnaissance*, and *liaison section* of battalion headquarters. In this section he has two agent messengers on motorcycles and an SCR-508 (12-volt) radio. All elements of the medical battalion are equipped with radios. Commanding officers of the medical companies of this battalion are charged with maintaining liaison with the medical detachments of regiments and battalions. They accomplish this mission through contact agents and by radio. Messages may be sent by litter bearers, ambulance drivers, and by walking wounded under certain circumstances. During radio silent periods when the division is going into assembly areas, contact agents in $\frac{1}{4}$ -ton trucks must be used. In combat, the use of special panels to indicate the location of collecting points requiring evacuation to the division G-3 air section of the bomber control unit may be necessary. This information would then be relayed to forward echelon of division headquarters. The employment of this system will be particularly applicable to the reconnaissance battalion and to other elements of the armored division that may have lost contact with other units with which it is operating.

MEDICAL SUPPORT OF THE MOTORIZED DIVISION

Introduction. A motorized division is a highly mobile infantry unit having great fire power. It is organized along the general lines of an infantry division. It generally is combined with two armored divisions and other troops into an *armored corps*.

The Medical Battalion Motorized. The division medical service of the motorized division is furnished by the Medical Battalion, Motorized (T/O 8-67). A motorized medical battalion is similar in organization to the medical battalion of an infantry division. It differs from a medical battalion in that it has many more motor vehicles. There are more men in a motorized medical battalion because of the larger number of motor vehicles.

The operations of all units of a motorized medical battalion are similar to those of the medical battalion of the infantry division described in the beginning of this chapter. Motorized divisions operate as infantry divisions when the personnel have dismounted from their vehicles. Medical support of such units consists of medical service furnished in camp or bivouac, medical support of marches, and after the combat zone is reached and troops are dismounted, the medical support in combat is identical to that of an infantry division.

The Division Surgeon. The medical section of division headquarters in a motorized division is identical in organization to that of an infantry division. The division surgeon is separate from the medical battalion commander. He functions as a staff officer and his duties are identical to those of the division surgeon of an infantry division.

Medical Support of Airborne Divisions

Introduction. Airborne divisions are a new addition to our fighting forces. They are smaller than corresponding units of the ground troops. The airborne division is transported to a combat area by airplanes and gliders. After disembarking from planes and gliders an airborne division will fight as an infantry division. Airborne divisions probably will be employed to hold areas initially captured by paratroops pending the arrival of armored divisions, motorized divisions or other reinforcements. Areas originally captured by paratroops and held by airborne troops generally radiate from air fields and portions or terrain permitting landing of cargo planes and gliders. Airborne divisions will be deficient in heavy transportation and heavy equipment. The equipment transported by cargo planes generally must be light. Vehicles of the $\frac{1}{4}$ -ton, 4 x 4 truck, and similar types will be carried in cargo planes. Such limitation on transportation will influence operations and the medical support of operations.

Medical Support. The division medical service of an airborne division is furnished by an Airborne Medical Company. This unit differs from the usual division medical unit in size and organization. Because of the smaller size of an airborne division the division medical unit has been correspondingly reduced. An airborne medical company is composed of a company headquarters, a division medical supply section, and three identical platoons.

Since transportation is limited, attempts to utilize commandeered vehicles, or other means of supplementary transportation must be improvised, to aid in the transportation of casualties. Evacuees are gathered near the fields utilized to land supporting cargo planes. Medical personnel with airborne divisions must be prepared to give treatment and temporary care pending arrival of transport planes. Temporary loss of air superiority may keep vulnerable cargo planes from arriving in the combat area for brief periods of time. Additional clearing support will be transported by air, but it will be delayed unless air superiority is maintained.

Troops and troop supplies are normally transported by the troop carrier wing of the air support command of an army air force. All cargo ships are equipped with litter racks, and they may be loaded with casualties before departing from the combat area on their trip to the home base. Medical personnel operating with airborne divisions must be acquainted with air operations and methods of air transportation. Speed during such operations is essential, and split second timing is paramount to success of airborne operations. Because of limitation of transportation, cargo space is at a premium. Extreme care must be exercised by medical personnel to utilize available cargo space for equipment and supplies that are essential and useful.

Casualties evacuated from areas occupied by airborne divisions are transported by air and are returned to hospitals in vicinity of base fields. At these hospitals definitive treatment and elaborate surgical procedures may be initiated.

MEDICAL SUPPORT OF MOUNTAIN DIVISIONS

Introduction. Mountain divisions are organized, trained and equipped to operate in extreme cold and at high altitudes. Vehicular transportation is limited, and pack transportation is included in most organizations. The large number of animals in a mountain division requires a large veterinary organization for veterinary service. Operations of such organizations require specialized training in extreme cold at high altitudes. Training is conducted in mountainous districts as in the Rocky Mountains of United States.

Mountain divisions are offensive as well as defensive organizations. Division artillery consisting of 4 battalions of pack howitzers allows considerable artillery support to operations entailing the use of the division.

MEDICAL BATTALION Mountain Division

Battalion Headquarters

HEAD- QUARTERS DETACH- MENT	COLLECTING COMPANY	COLLECTING COMPANY	COLLECTING COMPANY	CLEARING COMPANY	VETERI- NARY COMPANY
9—officers	5—officers			14—Officers	9—O's
43—men	78—men			137—Men	129—Men
Trucks	3—horses			15—Ambs (m)	Animals
Trailers	22—pack mules			Trucks	Trucks
	1—escort wagon			Trailers	Trailers

Plate 23. The Medical Battalion, Mountain Battalion.

Medical Support. The division medical service of a mountain division is furnished by the Mountain Medical Battalion, (T/O 8-135). This unit is organized along the lines of a medical battalion, but is modified to operate in support of a mountain division. It has a veterinary company. The collecting companies have no ambulances. The clearing company has three clearing platoons each consisting of a station section and a motor ambulance section.

No prescribed rules may be laid down for operation of the division medical service of the mountain division. Every operation will be different. Troops and animals must be trained to become accustomed to operate at high altitudes where it is cold. Medical troops must be trained in mountain climbing, and for the transportation of casualties

over mountain trails on pack animals, and up and down formations of terrain not adaptable to trails or trail building.

The principles of operation of the medical battalion of the infantry division, and the medical squadron of the cavalry division should form the basis of knowledge for plans and operation of medical units with mountain divisions.

MEDICAL SUPPORT OF THE ENGINEER AMPHIBIAN BRIGADE

Introduction. The Engineer Amphibian Brigade is a unit smaller than a division, yet it is of sufficient size to warrant inclusion of a medical battalion within its organization. This brigade has a headquarters, a headquarters company, a boat regiment and a shore regiment. There is also a maintenance company, a signal company, and an ordnance platoon. The supply of the unit is furnished by a quartermaster battalion, and medical support is given the brigade by the Engineer Amphibian Brigade Medical Battalion. Each regiment has its own attached medical units.

Medical Support. Each regiment and similar unit has a medical detachment. The medical battalion is furnished a large number of $\frac{1}{4}$ -ton trucks and a limited number of larger vehicles but no ambulances. The principles of operation of division medical service of the infantry division will apply to the engineer amphibian brigade, however, they must be greatly modified as this unit operates on water as well as on land. The problems of evacuation will be complicated by combined land and shore operations, modified by varying shore conditions, landing facilities and proximity of supporting medical units.

MEDICAL SERVICE OF THE CAVALRY DIVISION

The basic principles governing the employment of the medical service with cavalry are similar to those which apply to infantry, but the method of application is often very different. The diversity and rapidity of cavalry action, the relative dispersion, the character of terrain over which cavalry may operate, the small size of medical units, all tend to accentuate the difference between what may be termed a normal or a diagrammatic employment of medical service and that which can be made to fit each different situation. With infantry, the normal may nearly fit at times; with cavalry, only rarely will it do so. Quick thinking, resourcefulness, and initiative are essential in the handling of cavalry. The same is true of handling the medical service with cavalry. It is even more essential here than with other arms that the medical officer thoroughly understand the nature of the operations of cavalry and actually be a part of the cavalry. For the organization and employment of the attached medical personnel (regimental medical detachments) of the cavalry division, see Chapter I.

Principles of Operation. Due to the mobility of cavalry elements and to the small number of medical personnel serving with cavalry, it is especially important to bear the following in mind in all echelons:

All medical personnel and units must ordinarily keep up with the organization which they serve.

The tendency to disperse medical personnel by attaching undue numbers to detached cavalry elements must be avoided. Medical personnel so dispersed is much less effective than if held in readiness for use as actually required.

The mobility of medical units should not be impaired by unnecessary supplies or equipment. Dependence should be placed on rapidly and systematically advancing supplies to the point of need.

Casualties in all echelons should be rapidly concentrated at collecting points on the axes of advance, from whence they can be taken over by supporting medical elements in the rear.

Measures for the temporary care of casualties, pending their evacuation, must be improvised by all medical units.

Cavalry requires the close support of medical units operating from the rear, in order that the command may not be burdened with casualties for the care of which but little if any means will exist.

Functions of the Division Surgeon's Office. The duties of the surgeon of a cavalry division closely parallel the duties of the surgeon of an infantry division. The division surgeon's office is at the rear echelon of division headquarters, but during combat the division surgeon spends most of his time at the division command post and in inspecting the operation of the medical service so that he may keep in touch with the quickly moving situation. As a staff officer in combat, he submits to the division G-4 the recommendation for divisional medical service. When this is approved he turns it over, together with such other decisions as are necessary, to the staff of the medical squadron to prepare the squadron field order. If time is available, the squadron commander may issue an order, but these instructions will usually be in fragmentary form and will frequently be verbal. Mission type of orders are generally issued. They permit units to perform missions in a manner by the most expeditious means available. The remainder of the personnel of the division surgeon's office functions the same as in the infantry division.

EMPLOYMENT OF THE MEDICAL SQUADRON

A cavalry *squadron* corresponds to an Infantry or medical *battalion*. A cavalry *troop* is an organization similar to an infantry or medical *company*. The medical squadron is intended to give medical service to the cavalry division similar to that which the medical battalion gives to the infantry division. It is an organic medical squadron. Each troop is motorized and each is so organized and equipped that it may establish two small stations if necessary. The organization and general functions of the medical squadron are related in Chapter II. The same general principles govern the location of medical installations that apply in the infantry division.

The cavalry division as a whole does not engage in mounted combat, but in dismounted or a combination of mounted and dismounted action. In dismounted action, it frequently covers a wide front which, by increasing the distances and intervals, renders the procedure for the care, collection, and evacuation of casualties usual in infantry forces exceedingly difficult or impracticable. In accompanying cavalry over difficult terrain, on raids, or in pursuit, special difficulties are presented for the division medical service. As the medical squadron must at all times be free to accompany a rapidly moving cavalry organization and as its facilities for evacuation and care of patients are very limited, it must be closely supported by medical units in the rear, which should be available to evacuate the clearing station rapidly or to take over the care of patients who have collected there.

In Camp

In camp or march bivouac the medical squadron performs the same duties as does the medical battalion of an infantry division.

On the March

March Casualties. March casualties among personnel may, if specifically required by conditions, be cared for by detailing ambulances with regiments or by establishing march collecting posts as with infantry. However, due to the fact that the command is mounted, such measures will not frequently be required, the ambulances normally accompanying the column for tactical purposes or the divisional ambulance service being sufficient. March casualties among animals may frequently require veterinary march collecting posts to be established by small detachments of the veterinary troop.

Advance Guard Detachments. Advance guard detachments of medical troops are not required as frequently with cavalry as with infantry, as the forces are smaller, there are fewer casualties to be expected, and the mobility of the advance guard elements, of the main body, and of the medical squadron, permits a more rapid arrival of medical units from the rear of the column. An advance guard of a reinforced regiment may at times require a detachment of approximately two ambulances and eight men of the collecting troop and four men of the veterinary troop, all under one officer.

Detachments for a March in Two Columns. If the march is in two columns, one column should be accompanied by a detachment of the collecting and veterinary troops, while

the other column should have the remainder of the squadron. The clearing troop should not be split unless the two columns are so widely separated as to constitute virtually separate forces.

Division Widely Dispersed. When a considerable portion of the cavalry division is widely dispersed, as may happen on reconnaissance or counterreconnaissance missions, the medical squadron may move along or establish suitable elements on the axis of advance, near the main body. Casualties from the dispersed troops may then be collected daily or oftener by the collecting troop.

Marching with Service Trains. When marching, the medical squadron, less detachments, moves with the division trains until released.

In Combat

Whenever it is practicable, elements of the medical squadron should be placed in echelon behind the pivot of maneuver and along the main axis from front to rear. However, many situations will separate the pivot of maneuver and the maneuvering force by such great distances that it will be necessary to divide the collecting troop and establish a collecting station or collecting points with each of the two elements.

Employment of the Collecting Troop. The collecting troop consisting of troop headquarters and two collecting platoons, each composed of a collecting station section, a bearer section, and an ambulance section, with its equipment and personnel carried on motor vehicles, is capable of establishing two collecting stations. The troop commander is responsible for evacuation of squadron aid stations, providing a place of temporary treatment (collecting station), and evacuating collected casualties to the clearing station by means of motor ambulances. In an attack, its function is to establish a collecting station in rear of the divisional pivot of maneuver and promptly relieve squadron and regimental aid stations of their wounded. In addition, it must give service to the maneuvering force which may be a considerable distance from the pivot of maneuver.

The collecting station or stations. The exact location of the collecting station for the maneuvering force cannot be foreseen, but it is likely that it will handle the majority of casualties. One collecting platoon may be allotted to each force, or the platoon with the maneuvering force may be reinforced with additional personnel from the platoon with the pivot of maneuver. The collecting platoon with the maneuvering force should follow it into position, holding its station in readiness until the situation permits its establishment. When established, the location should be reported to the squadron commander. When the distance of the maneuvering force from the pivot of maneuver is great, then it may be preferable to attach a collecting platoon to the maneuvering force.

Ambulance service. In addition to providing litter bearer evacuation of aid stations, the collecting troop also provides motor ambulance evacuation to the clearing station. Each collecting platoon has twelve ambulances. Ambulance service may be controlled either by the troop commander by pooling the ambulances of the two collecting platoons, or in event of considerable distance separating the two forces, by the platoon leader of the collecting platoons. This service is operated as in an ambulance section of the infantry division. When conditions permit, ambulances are utilized to assist in evacuation forward of the collecting stations from collecting points or even from aid stations.

In *defensive action*, when the defense is of short duration, the position weakly held, and in great width and little depth, casualties will be fewer. The designation of well-chosen collecting points and the use of ambulances ahead of collecting stations facilitate the collection of casualties. When the defensive measures are strong and protected, the collecting troop operates as does the collecting and ambulance companies in the infantry division.

In *delaying action*, the operations of the collecting troop are similar to those of a weak defense. Ambulances are pushed as far forward as possible to assist in evacuation. Collecting stations are kept mobile.

Employment of the Clearing Troop. The clearing troop is so functionally organized (See Chapter II) that each of its two clearing platoons is capable of providing a small clearing station. Initially, only one platoon establishes station, the other platoon being

held in readiness to move either forward or to the rear, or provide additional beds, as the situation demands.

The clearing station or stations. The location of the clearing station depends upon many factors, such as the type of operation, road net, terrain, and enemy resistance. It should be beyond the range of hostile light artillery and convenient to the mass of expected casualties. The maximum use should be made of existing buildings to save time and labor and to provide shelter for such casualties and attendants as it may be necessary to leave behind until they can be evacuated by supporting medical service.

Employment of the Veterinary Troop. For organization, see Chapter II. The veterinary troop provides the evacuation and limited care and treatment facilities for animals as does the collecting and clearing troops for men. In combat, the third platoon (clearing) establishes the veterinary clearing station.

The veterinary clearing station or stations. The location of the veterinary clearing station depends upon the type of operation employed by the cavalry division. In general, the station should be located in proximity to the mass of expected animal casualties. The collecting platoons evacuate veterinary aid stations (See Chapter I) by means of lead lines or horse ambulance. In situations where there is a pivot of maneuver and a maneuvering force, one clearing station may be assigned to evacuate each force.

Employment of Headquarters Detachment. For organization, see Chapter II. The headquarters detachment provides the operating personnel for the detachment and squadron headquarters. The medical and general supply section functions the same as the corresponding section in the Headquarters Detachment of the medical battalion. The distributing point in combat is normally established in the vicinity of the clearing station established by the clearing troop.

CHAPTER IV

THE MEDICAL SERVICE WITHIN THE CORPS AND ARMY

It is doctrine that the higher echelon assume responsibility for evacuating casualties of men and animals from its principal subordinate units (see Plate 1); further, that the higher echelon will reinforce its principal subordinate units when their organic components are inadequate for conditions which arise or when unusually severe missions are assigned. The independent corps, for example, assumes responsibility for evacuating the clearing stations of casualties of the divisions which it includes; it reinforces the divisions with additional medical units when the medical means of divisions are inadequate. The army, for similar reasons, evacuates the casualties from its several corps and divisions and furnishes reinforcements of additional medical means whenever the need exists. Casualties within a division are assembled at the division clearing station by medical personnel of the division, but they are cleared or evacuated from clearing stations by the medical units of the army or by the corps when the corps is operating independently. Reinforcing units may include surgical hospitals or an additional medical regiment or battalion as is indicated by the situation and the means for making reinforcements which the larger unit has available. For these reasons the organic strength of medical personnel or divisions can be kept at a minimum sufficient only for routine or normal missions. Aid from higher echelons will be usual in battle and campaign.

This chapter deals with the functions of medical units of the corps and army (FM 8-15). The principles of supply and evacuation of large units are presented in Chapter VI, Part I. Tables of Organization of large units are shown in Chapter III, Part I. The whole theory of reinforcing units is presented in Chapter V, Part I. Those chapters should be consulted as reference in the study of this subject.

MEDICAL SERVICE OF THE CORPS

Organization and Employment of the Medical Service of the Corps. The medical service of the corps is organized into two echelons as follows:

Corps medical service: headquarters corps medical service and one medical battalion (T/O 8-15).

Attached medical personnel: the medical detachments of the units of corps troops.

Headquarters Corps Medical Service. The medical section of Headquarters, Corps consists of 5 officers, 1 warrant officer and 7 enlisted men. (T/O 100-1). The headquarters, corps medical service may be divided into six divisions with staff supervision of general functions as follows:

Administrative division. The corps surgeon is primarily concerned with the medical service of corps troops. He does not command the corps medical battalion, as it is provided with a commander. The corps except when acting independently, is not a link in the chain of evacuation. The corps surgeon, as a staff officer, has staff supervision of collection and evacuation within the component divisions of the corps as directed by the corps commander. He may act as the agent of the army surgeon in all tactical situations. He may act as the agent of the army surgeon in all Medical Department functions concerning the entire corps. Ordinarily, the corps surgeon supervises the division medical service only in so far as it is necessary to keep the army surgeon informed of conditions within the corps that affect the medical service. The corps surgeon assists the army surgeon by suitable recommendations.

Preventive medicine division. All matters pertaining to the prevention and control of disease; supervision of sanitation, field investigations, hygiene of food and water, and statistics of diseases and non-battle injuries. The corps medical inspector is responsible to the corps surgeon for the direction of sanitation among corps troops.

Operations and training division. Medical operations, training of medical troops, evacuation, and reports and returns of battle casualties. The evacuation officer is concerned with the collection and temporary care of the sick and the battle casualties

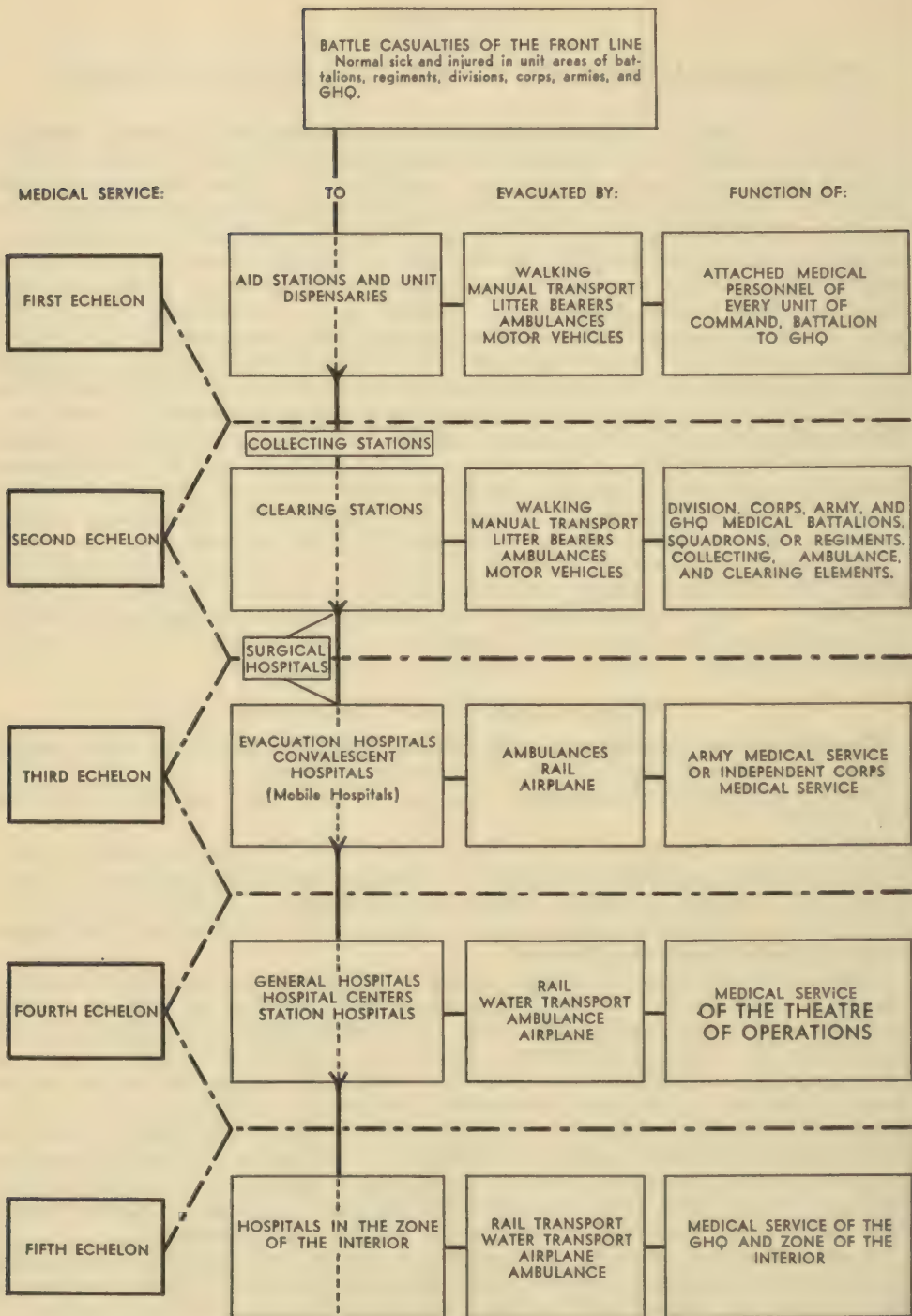


Plate 1. Classification of Field Medical Service by Echelons (Schematic).

among corps troops; he arranges with the surgeon of the field army or of GHQ for their evacuation from the corps.

Dental division. The dental division includes the corps dental surgeon, who, under the corps surgeon, is concerned primarily with the administration and supervision of the dental service among corps troops. X

Veterinary division. The veterinary division includes the corps veterinarian and an enlisted assistant. He is concerned with the administration of the veterinary service among corps troops. The veterinary officer an assistant to the corps surgeon may exercise staff technical supervision of the veterinary service in the divisions belonging to the corps in much the same manner as the corps surgeon may do for men. X

Supply division. The supply division is concerned with the medical supply requirements of corps troops, supply inspections, and, when authorized, the allocation of supplies or supply credits among divisions and corps troops. X

The Corps Medical Battalion. The corps medical battalion has the same general functions with relation to corps troops as the division medical battalion has to divisional troops. In addition, the battalion may, when practicable, be used to augment or reinforce the medical service within the division of the corps. It is not, however, normally a link in the chain of evacuation from the divisions nor is it usually concerned with the medical supply of divisions.

The *battalion commander* utilizes the components of his battalion to accomplish the mission assigned him by the corps surgeon.

The *collecting companies* are utilized to assist in area sanitation, to establish corps collecting stations when necessary, to support or reinforce division collecting units; they may be used to assist in litter bearer work in evacuation and at surgical hospitals operating in advance of the corps rear boundary. The *ambulance sections* render local service for corps troops and may be used to reinforce the divisions or even to assist the army ambulance service during periods of stress. In an independent corps they are utilized to evacuate casualties from the clearing stations of divisions and corps troops to the evacuation hospitals.

The *clearing company* establishes clearing stations for corps troops and may relieve or reinforce the clearing units of division medical units. They may also be employed to care for slight, contagious, or gas cases, thereby relieving the divisions of this task. Clearing companies, augmented or otherwise, may also be used in lieu of surgical or evacuation hospitals when the corps is acting independently and the situation does not demand a large medical establishment. The trucks of the corps clearing company are sometimes used to transport the equipment of surgical hospitals within the corps zone when such units are attached to the corps.

The *headquarters detachment* distributes general supplies to the corps medical battalion and also establishes a distributing point for medical supplies for medical detachments with corps troops. When the corps is acting independently and an army depot or portion thereof is not attached, the headquarters detachment, reinforced or otherwise, may operate a corps medical park and distribute medical supplies to divisions. Medical supplies carried are limited to the capacity of the available transport. They are usually replenished from the army medical depot by sending trucks thereto. When on an independent mission, medical supplies may, however, be obtained direct from a designated communications zone depot through the regulating station.

The *veterinary company, separate (T/O 8-99)*, if any, establishes a veterinary clearing station for corps troops. In an independent corps it may also be utilized to conduct veterinary evacuation from the divisions.

Regimental Medical Detachments with Corps Troops. These detachments function in the same manner as the regimental medical detachments of the infantry division.

General Functions of the Medical Service of the Corps. The corps medical service, when the corps is acting as part of an army, has the following general functions:

Supervision of training of the medical personnel belonging to corps troops in accordance with the requirements of the army.

Supervision of sanitation of corps troops.

Collection and temporary care of sick and battle casualties among corps troops.
Utilization of the corps medical battalion to augment the army medical service and to assist the medical service within divisions.

The issue of medical supplies to corps troops.

Administrative functions relative to medical personnel of corps troops.

Attached Medical Department Personnel of Corps Troops. (See Chapter III, Part 1, "Organization of Large Units.") Medical Department personnel is attached to those units and functions in a similar manner to like units of the infantry division. See the Tables of Organization for strength and distribution of this personnel. When their units are engaged in combat they furnish primary combat medical service. When their units are not engaged actively in combat, and many units of corps troops are employed habitually in rear areas, they furnish a dispensary service.

Corps Medical Service in the Army Chain of Evacuation (FM 8-15). The corps medical service and division medical services are in the same medical echelon, which is to say that the casualties of the divisions normally are not evacuated through corps medical installations but that the casualties both of divisions and of the corps are evacuated by the army medical service.

The Medical Service of an Independent Corps. When a corps is acting independently the functions of the medical service, including that of the corps surgeon, are similar to those of the army medical service. The corps medical battalion will generally be insufficient to provide adequate medical service for a corps in an independent campaign. In this case it is usually reinforced by additional medical units from the army or GHQ reserves. These units may consist of an animal drawn or motor ambulance battalion or an entire medical regiment, a suitable number of field hospitals, evacuation hospitals and surgical hospitals, a portion of an army medical supply depot, and a veterinary company separate and a veterinary evacuation hospital.

Plan for the Corps Medical Service. In a corps which forms part of an army, the plan of the corps surgeon for utilizing the corps medical service is generally limited to the measures he proposes to take for the collection, sorting, and temporary care of corps troops and the reserves he proposes to retain for support or reinforcement of the division medical services. The plan for the corps medical service is submitted as a recommendation to G-4 for coordination and for approval of the commanding general. Any movement orders necessary are then issued by G-3, although frequently the surgeon will draft the orders.

The first paragraph of the approved plan is incorporated and published in the corps administrative orders as part of paragraphs "1, Supply" and "2, Evacuation." This is all of the information of the medical service that the units of the corps require. Sub-paragraph "1, Supply," usually includes the location of the medical refilling point so that the corps and division medical units may know where to obtain medical supplies. Sub-paragraph "2, Evacuation," includes the designation of the place or places to which the army will evacuate casualties from the corps and its divisions, but the number or designation of evacuation hospitals located thereat is not required. It also includes the location of the clearing station or stations for corps troops, and the designation of the point to which the army will evacuate animal casualties for corps troops.

The remainder of the plan is for the purpose of assigning more definite missions to the corps medical battalion. In doing this, latitude must be given the battalion commander. The corps surgeon must, however, insure that the necessary means are provided and must obtain authorization of G-4 for the use of roads, sites, and other coordination which may be necessary. Collecting stations for men are not usually required for corps troops, as casualties from the corps artillery and other units in the forward areas will generally be collected by ambulance direct from regimental or battalion aid stations or by division units. At the beginning of an action the collecting companies of the corps medical battalion are usually held in reserve for support or reinforcement of divisions as may be required.

Medical plan of an independent corps. In an independent corps, with attached medical

units, a portion of the medical plan is published in the administrative order, and the details of the plan are published as an annex to the administrative order as is done in the case of the army medical service.

MEDICAL SERVICE OF THE ARMY

Organization of the Medical Service of the Army. The medical units for an army are shown in Chapter III, Part I, "Organization of Large Units." The number of medical units actually assigned to an army may differ from the type army medical service due to variations in the combat forces, the situation, and the territory occupied. The army medical service is organized into two echelons as follows:

a. The army medical service which is composed of:

Medical section of army headquarters. Includes the army surgeon and his commissioned and enlisted assistants. The personnel consists of 25 officers, one warrant officer, and 35 enlisted men (T/O 200-1, Headquarters, Army).

Army medical units (type army):

3 medical regiments. ✕	1 medical supply depot.
4 surgical hospitals. ✕	1 medical laboratory.
12-14 evacuation hospitals.	1 attached veterinary company (separate). ?
1 convalescent hospital.	

b. The attached medical personnel comprising the medical detachments of army troops.

General headquarters reserve units—surgical, evacuation, and veterinary evacuation hospitals and teams from the auxiliary surgical group—are also assigned to armies from time to time to reinforce the medical service as the need therefor becomes evident.

Attached Medical Department Personnel of Army Troops. The attached Medical Department personnel strength of army troops, exclusive of the attached medical personnel of the divisions and corps which are part of the army, is in direct proportion to the number of auxiliary units assigned to the army. Each of the units of the type army organization have a medical detachment to render first echelon medical service.

Missions of Army Medical Service (FM 8-15). The basic missions of army medical service are to:

Relieve corps and division medical services of continued care and treatment of their sick and injured in such a manner that their own organic medical services retain full mobility.

Furnish direct medical support to the unit medical services of army troops operating outside the zones of responsibility of corps and division medical services.

Collect into army installations all evacuees in the army area, there to sort them, continue their care and treatment, and prepare such as require it for further evacuation.

Reinforce the medical services of divisions in situations wherein they require greater medical means than are organically provided them.

Institute and supervise, through proper channels, all practicable measures that can be directed toward the conservation of the physical fitness of the able-bodied.

Discharge all functions, comparable to the foregoing, in connection with the animals of the army.

Procure for and distribute to all elements of the army the items of supply furnished by the Medical Department.

The army surgeon. The army surgeon performs the functions of surgeon on the staff of the army commander and is the supply branch representative of the Medical Department within the field army. The army surgeon establishes his office at the rear echelon of army headquarters. He divides his time between the office, the army command post, and the medical units of the army. When duty requires him to leave the army command post, the army surgeon leaves a capable assistant to represent him at the command post.

Establishments of the army medical service are usually moved on orders issued by G-3 on recommendations of the surgeons submitted to G-4. The surgeon, however, usually initiates all measures for coordination, the obtaining of transport, etc., and will frequently draft movement orders for the signature of G-3. Orders for the transfer of individuals, supply arrangements, and other administrative details within

the army medical service may also be issued by the army surgeon in accordance with announced policies. Medical units of subordinate commands, such as corps and divisions, function directly under the commander thereof, the army surgeon exercising staff supervision of their technical operation only. When it is desirable to issue orders or instructions that could in any way conflict with functions of command, the army surgeon makes the necessary recommendations to the proper general staff section for incorporation in orders to be issued through the usual channels.

In his capacity as *technical adviser* to the army commander and the general staff on medical subjects the army surgeon should be prepared to submit recommendations and plans for:

- The technical training of all troops in sanitation, hygiene, and first aid.

- The preservation of the health of the command.

- The use of medical troops and establishments in any situation.

- The coordination and execution of all matters relating to the duties of the medical service.

- The replacement and assignment of medical personnel and units.

- The supply of medical equipment and material.

As head of a supply branch, he is responsible that the needs for medical supplies are anticipated and that these supplies are at all times available to the troops for which they are intended.

In order to control and supervise the medical activities of the army as outlined, the surgeon must keep himself informed of present and future operations and administrative plans; the positions and missions of the larger combat groups; location, status, and condition of units of the army medical troops; the location, number, and classification of casualties; and the enemy's medical activities and medical establishments. In order to secure this information, he keeps in close communication with the assistant chiefs of staff, requires periodical situation reports from his subordinates, and makes personal reconnaissance and inspections.

The army medical units are so disposed in all situations as to provide the necessary service in accordance with the tactical plans and in a manner which is most economical of transport and personnel. This is usually accomplished by distributing such medical units as are necessary for current or immediately foreseen needs, in positions from which they can readily care for the sick and the battle casualties of specific subdivisions of the army area. The remainder of the army medical units are grouped together, so far as is practicable, in order to facilitate administration, training, and control. The location of this group is such that the units will be readily available for use where needed as reinforcements or for advancement by bounds. The exact site for all units is usually determined by the relation of roads and railroads to the disposition of combat troops. The units which are established are located sufficiently close to the troops which they serve to permit of proper functioning, yet beyond the range of effective heavy artillery fire, and, so far as practicable, out of the area of congestion of combat troops. The reserve units are located in rear of the congested area and in active situations are held as mobile as is practicable, that is, loaded or ready to load on railroad cars.

Plan for the Army Medical Service. In coming to a decision as to the utilization of the army medical service in a given situation, the army surgeon must make a complete estimate of all factors in the situation which affect that service. In combat, the basic factors in the estimate will usually be the type of operation contemplated, the mission assigned to larger elements, and when and where the greatest casualties are likely to occur. His decision is expressed in a plan which is submitted to G-4 for coordination and approval in the name of the commanding general. This plan should be specific, easily understood, and in such form that part of it may be incorporated without change in the army administrative order. It should also be in such form that it may be published as an annex to the administrative order with but slight modification. It is desirable also that the separate subparagraphs giving the missions to units of the army medical service be such that they can be used as drafts for movement orders with but slight modification. (See Chapter VII.) In actual warfare, a complete plan for an army engagement in one document will not often obtain. A general plan should always be possible, which may

then be amplified by orders for individual units and instructions issued from time to time in accordance with the changing circumstances.

Medical Section of Army Headquarters (T/O 200-1). The medical section of Army headquarters provides a staff for the army surgeon in order that he may coordinate and direct the medical service within the army in accomplishing the functions listed above. There is no prescribed internal organization of this medical section. Nor can any rigid rule be laid down that will meet the requirements of all situations in which an army may find itself. Because of the major staff functions of the army surgeon the following divisions of this section may serve as a guide:

Administration. This subsection is charged with all routine administration, personnel administration, and with the coordination of the other subsections. It is headed by the executive officer.

Operations and training. This subsection should be under the supervision of a medical officer specially qualified in the military aspects of medical service. Several of the functions of the army surgeon are grouped into this subsection. The functions of this subsection include staff supervision of the following activities:

Training: Training of medical units and the training of all other units in personal hygiene and first aid. Training policies, programs, and inspections.

Employment of army medical units: Assignment of medical tasks to army medical units. Allocation of reinforcements to lower echelons. Movements of medical units and the locations of army medical installations.

Evacuation: Evacuation activities for men from the divisions back to the regulating station, coordinating all activities of the army medical regiments, evacuation hospitals, G-4, and the medical regulating officer. The evacuation officer often has his desk in the office of G-4 and acts as representative of the army surgeon.

Hospitalization: Policies, supervision, and administration of the care and treatment of sick and injured. The utilization of existing structures and facilities for hospitalization.

Consultants: Act in an advisory capacity to the army surgeon on professional matters and supervise the training of personnel in specialties and the treatment rendered in the hospitals of the army.

Preventive medicine. This subsection is headed by the army medical inspector and handles all matters pertaining to the prevention and control of disease and injury, and the supervision of the army medical laboratory.

Supply. This subsection maintains statistical data relative to medical supply, estimates requirements, and supervises the procurement and distribution of medical supplies. It maintains liaison with G-4, the army depots, the regulating officer, and the communications zone medical supply agencies. This staff is not an operating agency in supply.

Dental. The army dental surgeon and assistant, under the direction of the army surgeon, supervise the dental service of the army as a technical service in the same general manner as it is done in the division.

Veterinary. This subsection coordinates and directs the operation of veterinary units of the army medical service and exercises technical supervision of veterinary activities in the corps and divisions. It supervises the evacuation of animals from the divisions back to the army veterinary hospitals and initiates measures for the evacuation of animal casualties from the army area. This subsection is in charge of the army veterinarian who has an assistant, the meat and dairy hygiene and forage inspector.

Enlisted assistants. Enlisted men are provided for distribution among the various sections.

Army Medical Regiments (T/O 8-21). Three regiments are allotted to the type army. They furnish medical service to army troops not otherwise provided for; then support and reinforce the medical service of infantry and cavalry divisions and the corps; further, they assist other units of the army medical service. Medical regiments are usually sent to a suitable central location and are ordered to cover a specified area such as a corps zone of action or all or a part of the army area in rear of corps boundaries. The manner in which the designated area is to be serviced is prescribed in general terms, or in detail, as required by the situation. The

regimental commanders then distribute the elements of their regiments in such a manner as best to accomplish their missions. This may result in a wide separation of the various elements of the regiment.

Emergency evacuation stations may be established by detachments (collecting and clearing companies) of army medical regiments at points on railroads in advance of or removed from the evacuation hospitals when rail transportation is more available or more economical than movement by motor. These stations are particularly useful for slight and moderately severe cases who can be transported in flat cars or box cars when the advance of the main forces has left the evacuation hospitals well to the rear.

Headquarters and service company (T/O 8-22). Each headquarters and service company serves its regiment and distributes medical supplies to medical detachments with army troops within the area serviced by the regiment.

Collecting companies. The collecting companies are used in the sanitary administration of the army area and in the collection of casualties from army troops. Collecting stations are often established for groupments of army artillery, but other collecting stations are not usually established for army troops. The collecting companies may assist evacuation hospitals by furnishing litter bearers for handling patients entering and leaving the hospitals. They are also used for reinforcements and relief for division collecting companies.

The *ambulance section of the collecting companies*, assisted in emergency by trucks or other available transportation, evacuate patients of the division, corps, and army clearing stations and surgical hospitals, to evacuation or convalescent hospitals or to emergency evacuation stations for transfer by rail to an evacuation hospital. Army ambulance units should begin to arrive at division stations about three hours after combat begins and continue thereafter as rapidly as needed to clear the station. Ambulances may operate in convoy. Ambulance sections may be used, when necessary, to transport patients in and about evacuation hospitals and are used as reinforcement or relief for division ambulance units. In addition, ambulances are required to evacuate army troops and reserve units.

Clearing companies. The clearing companies furnish temporary care to army troops and constitute a reserve to reinforce corps and division clearing stations or to relieve these units to permit of their forward movement. Clearing companies may also be employed to care for slightly wounded, contagious, or gas cases, or be employed in lieu of evacuation or surgical hospitals when the situation does not demand a large establishment.

X SURGICAL HOSPITAL

The surgical hospital is an independent, self-supporting army unit and is under the direct control of the army commander or the army surgeon as may be directed. A type army contains four such units.

Organization. The surgical hospital, a mobile unit, is composed of a headquarters and three subordinate elements, (one mobile surgical unit and two hospitalization units). The surgical hospital is not motorized, the headquarters and the hospitalization units having only sufficient integral transport for their internal economy. However, within the hospital the mobile surgical unit is motorized. In some instances this organic transport takes the form of ordinary trucks; in others it consists of special bus or van-type motor vehicles in which are permanently installed the various functional elements of the surgical unit. In both cases the transport is sufficient to move the unit's personnel and materiel.

The character of the organization of the surgical hospital permits:

Independent operation of the mobile surgical unit.

Independent operation of either or both hospitalization units.

Separate establishments of ward sections of the hospitalization unit with partial dependence upon the latter for administration.

Surgical hospitals are mobile units designed primarily to furnish, as far forward as practicable, facilities for major surgical procedures for a limited number of cases of

[illegible]

Plate 2. T/O 8-570, April 1, 1942.

serious injury, and to relieve division clearing stations of nontransportable casualties. Its facilities are reserved for:

Cases in which immediate medical or surgical treatment is necessary to save life or limb.

Cases in which immediate movement to an evacuation hospital would gravely endanger life or limb.

Surgical hospitals may be used in emergencies to substitute for evacuation hospitals.

Detachments of technical personnel of surgical hospitals, such as operating teams, may be used to reinforce other medical units at station.

Headquarters and Staff. The unit is commanded by the senior officer of the Medical Corps assigned thereto and present for duty.

The headquarters includes the unit commander, one commissioned assistant, and the following enlisted assistants: a master sergeant (sergeant major), a chauffeur, a clerk, and an orderly.

The commander is responsible to the army commander or the army surgeon, as is prescribed, for the discipline, training, administration, and operations of the unit in all situations. Although retaining this responsibility, a great deal of the actual management of these four phases is delegated to the three subordinate commanders. Each of the latter, with his separate headquarters, is more or less administratively independent.

During operations if the subordinate elements of the unit are separated, the headquarters remains with one of the hospitalization units. Routinely, the headquarters personnel mess with the headquarters of one of the hospitalization units and the enlisted personnel are also attached thereto for discipline, training, and administration.

The *Staff* consists of the adjutant, of the Medical Corps or Medical Administrative Corps, charged with the usual duties of that office and such other officers as may be charged by the commander with staff duties.

Mobile Surgical Unit. Each surgical hospital contains one mobile surgical unit. This unit possesses sufficient integral transport for its own movement, together with the necessary facilities for messing, supply, and technical operation.

The personnel and functions of all mobile surgical units are identical. However, on the basis of means whereby the unit performs its peculiar functions, there are *two types*:

One type moves its personnel and materiel by ordinary truck transport and upon arriving at the site of operations installs its equipment and performs its technical functions in existing shelter or under a canvas.

The other type has included in its transport four operating rooms installed in a like number of bus or van-type motor vehicles in which the unit performs its technical functions.

The unit is commanded by the senior officer of the Medical Corps assigned thereto and present for duty. He is responsible to the commander of the hospital for the operation of the surgical unit.

Based upon type function, the unit divides itself into an administrative and a technical section.

Administrative section. This section consists of three officers, *i.e.*, the unit commander (Medical Corps), an electrical and gas engineer (Sanitary Corps), and the mess, supply and transportation officer (Medical Administrative Corps). The Sanitary Corps officer is charged with the operation of the power plants and other utilities. The section also includes the unit first sergeant, and;

Mess and supply group.

1 Sergeant

1 Technician grade 5 (clerk, general)

1 Technician grade 5 (cook)

1 Technician grade 4 (cook)

1 Private, first class, or private (cook's helper)

1 Private, basic.

Utilities group.

1 Technician grade 4 (electrician)

1 Technician grade 5 (engineer, powerhouse)

1 Technician grade 4 (engineman, operating)

1 Technician grade 5 (plumber)

1 Private, basic.

Transportation group.

1 Sergeant

1 Technician grade 5 (mechanic automobile)

2 Technician grade 5 (driver, light truck)

8 Privates, first class, or privates (driver, light truck)

1 Private, basic.

One private, first class or private functions as the orderly of the unit commander.

This section has Administrative supervision of all enlisted men of the surgical unit;

Operation of the unit mess;

Procurement and handling of all supplies required by the surgical unit;

Operation and maintenance of the power plants (two) and other utilities, (Aids the technical section in the mechanical operation of the X-ray and sterilizing facilities.)

Operation and second echelon maintenance of the unit transport, During movement of the unit, all personnel of the transportation group are required to act as chauffeurs and furnishes assistance to the unit commander in the exercise of his administrative functions.

Technical section. The technical section includes two surgical, one splint, one shock, and one plastic-maxillo-facial team, one officer especially trained in X-ray procedure, one X-ray, two medical, one dental and five surgical technicians.

The technical section is responsible for the technical (surgical) procedures as required for the surgical unit. In the normal situation, that is, while operating in the vicinity of a clearing station, these procedures will take the form of emergency measures. Definitive treatment is rendered in a surgical hospital to the extent of transforming nontransportable casualties into transportable casualties for movement to evacuation hospitals farther to the rear. The treatment of shock, control of stubborn hemorrhage, the reconstitution of blood following hemorrhage, and the fixation of fractures that are too complex to be handled in a clearing station are among the procedures carried out.

If operating with a surgical hospital in the army area or if augmenting the surgical service of an evacuation hospital, the section may institute still more definitive procedures.

The packing, unpacking, installation of equipment, and operation of the operating rooms, X-ray and sterilizing departments (in vehicles, existing shelter, or under canvas).

Employment. The mobile surgical unit may (1) operate with the hospitalization units or elements thereof of the surgical hospital of which it is a part; (2) be detached to operate with the hospitalization units or elements thereof of other surgical hospitals; or (3) be detached to supplement temporarily the surgical facilities of any army evacuation hospital or of any other medical unit requiring temporary surgical support.

Hospitalization Unit. The surgical hospital contains two identical hospitalization units, each capable of independent operation. This permits echelonment laterally or in depth, and increases the hospital's mobility by permitting it to move with one hospitalization unit and initiate operation while the other unit remains at the former location pending clearance.

The unit is commanded by the senior officer of the Medical Corps assigned thereto and present for duty. He is responsible to the hospital commander for the operation of the unit.

Functions. The hospitalization unit renders care and treatment, other than those technical procedures rendered by the mobile surgical unit, to all patients admitted to the surgical hospital until such time as the condition of such patients and the facilities of the army medical service permit their further evacuation.

The normal capacity of one hospitalization unit is 200 patients, thus giving a surgical hospital a normal capacity of 400 patients.

Headquarters section. The headquarters consists of the unit commander (Medical Corps), a mess officer, a registrar and adjutant combined, a chaplain, a principal chief nurse, and enlisted personnel to assist in the interior administration of the unit. If the unit is operating intact, the headquarters remains with it; if a ward section or a

portion thereof is operating separately, it may be augmented by personnel from headquarters for operation of a mess.

Being a unit capable of independent operation, the commander thereof is assisted by a unit staff. One officer is charged with the duties of the unit supply and mess, and in addition may be designated detachment commander. The chaplain performs the usual duties of his office. (TM 16-205).

One officer is charged with the duties of registrar and adjutant and in addition may be designated unit personnel officer and commanding officer, detachment of patients.

A suggested functional grouping of the enlisted personnel is as follows:

Headquarters.

- 1 First sergeant
- 1 Corporal (clerk)
- 1 Technician grade 5 (Chaplain's assistant)
- 1 Technician grade 4 (stenographer)
- 3 Privates, first class, or privates (orderlies).

Registrar's office.

- 1 Staff sergeant (clerk, general)

Unit supply.

- 1 Sergeant
- 1 Private, first class, or private, (stock clerk)
- 1 Private, first class, or private, basic.

Mess.

- 1 Staff sergeant
- 4 Technicians grade 5 (cooks)
- 4 Technicians grade 4 (cooks)
- 1 Technician grade 5 (clerk, general)
- 2 Privates, first class, or privates, (cook's helper)

Transportation.

- 1 Sergeant
- 4 Privates, first class, or privates, (Driver, light truck)

Utilities.

- 1 Technician grade 5 (sanitary)
- 1 Private, first class, or private (repairman, utility)

Technical section. The personnel of the technical section consists of: One medical officer (operating surgeon); three medical officers (1 anaesthetist with special training in treatment of shock, 1 roentgenologist, 1 clinical pathologist with special training in wound bacteriology); one dental officer; two nurses; one technical sergeant and nine technicians. The technicians are divided as follows:

- 1 Technician grade 4 (pharmacist)
- 2 Technicians grade 4 (laboratory)
- 1 Technician grade 5 (laboratory)
- 1 Technician grade 4 (X-ray)
- 1 Technician grade 5 (X-ray)
- 2 Technicians grade 3 (surgical)
- 1 Private, first class, or private (Technician, laboratory)

The section is charged with the establishment and operation of an operating room (tent), and X-ray department, a laboratory, and a dental service. The scope of all departments is extremely limited. The section assists the personnel of the ward sections in the treatment of cases, especially the post-operatives and those in shock, and packs, unpacks, and installs the section equipment as indicated.

The employment of the technical section varies with the situation. Depending upon the presence or absence of the mobile surgical unit and the other hospitalization unit, the section may:

Act independently in the performance of technical procedures for one or both ward sections.

Act jointly with the corresponding section of the other hospitalization unit in the establishment of its various services.

Augment the technical section of the mobile surgical unit.

Ward section. A ward section establishes and operates six wards (tents or buildings) with a total capacity of 100 patients. Each hospitalization unit contains two identical ward sections. A ward section routinely packs its equipment (including six ward tents) separately, and augmented by mess personnel from the unit headquarters may be detached to care for patients awaiting clearance. The condition of such patients may preclude their evacuation, although such procedures as are normally performed by the mobile surgical unit or the technical section of the hospitalization unit should be accomplished prior to such detachment. The ward section has neither the personnel nor the facilities for elaborate technical procedures.

The personnel consists of four medical officers, (a section commander and 3 ward officers), 12 nurses, one sergeant, (section leader), 6 corporals, (ward-masters); and 32 privates, first class, or privates, (6 medical, 1 sanitary, and 12 surgical technicians, and 13 unrated). Enlisted personnel are sufficient to keep six wards in continuous operation.

The qualifications required for the personnel of the surgical hospital approximate those for the enlisted personnel of the evacuation hospital.

Since plans and training officers are not assigned the commander may either assign an officer from one of the units to his headquarters and charge him with the planning and management of all training, or he may issue general training directives and allow each of the three units to proceed with their training within the limits prescribed. A combination of these two possibilities is suggested. Centralized planning and management of all individual training, including specialist, will promote economy of time and effort, decrease the number of instructors needed, and insure a uniform attainment of objectives. To a greater extent, the management of group training may be delegated to the subordinate unit commanders. However, even in group training, especially within the two hospitalization units, much of the group training may be correlated and combined. Unit training resolves itself into two phases, a phase for the unit training of the three units of the hospital, and the unit training of the surgical hospital in its entirety. It is suggested that the management of the former phase be delegated to the unit commanders, and the latter be retained by the commander of the hospital and his designated assistants.

Specialists shown in Table of Organization 8-570 must be trained.

One man in the administrative section of the mobile surgical unit who has a basic knowledge of automobile mechanics is especially trained in the operation, care and maintenance, and repair of gasoline engines, especially those used in the power plants of the unit.

The plumber is also trained as a chauffeur, as during movement of the unit his services are required to drive one of the motor vehicles.

Unit Training. During the *first phase* of unit training, each of the three units is trained to function as a unit. All individual and group training is correlated in the establishment and operation of that portion of the hospital for which each unit is responsible.

During the *second phase*, the entire hospital unit is trained to function as a whole. The scope should include correlation with the army surgeon to obtain motor transport for the hospitalization units, thus allowing the entire unit to be trained in the loading and unloading, packing and unpacking of equipment, establishment and simulated operation of the surgical hospital. This phase of the training is vital, as upon it will depend much of the future efficiency of the hospital. Speed in movement and speed in the establishment of the installation are most important factors in the general value of the surgical hospital and their attainment is only to be gained by thorough training.

Combined Training. Training with other units is possible only during large scale maneuvers and the responsibility for the planning and actual management rests with the army surgeon. The unit commander is responsible only for the operation of his own unit.

Installation. The installation of the unit is the surgical hospital, and one unit (surgical hospital) establishes but one installation.

Subordinate elements (hospitalization units) may be installed temporarily in two locations but collectively they constitute a surgical hospital. The normal bed capacity is 400 patients.

Information herein is applicable chiefly to the installation established to support a division clearing station but the principles may be applied to the same installation functioning in other capacities.

Movement into position. Normally the entire unit, personnel and materiel, is moved by common carrier to a convenient railhead. From thence to a site in the vicinity of the clearing station the mobile surgical unit moves by its integral transport, the remainder of the hospital by motor transport, army or division.

Location. If in conformity to the tactical situation and if not immediately adjacent to the clearing station, a good motor road should connect the two installations. Similarly, a motor road should lead to the rear for utilization of army evacuation elements. If suitable existing shelter is available in appropriate location, it will be utilized. The establishment of the entire installation in buildings require approximately 30,000 square feet of floor space.

The organizational equipment contains sufficient canvas for the entire installation when the utilization of such is necessary or desired. A space of approximately 125 by 80 yards is required under these circumstances, but allowance is made for possible expansion if the installation is augmented by additional hospitalization units.

The physical arrangement will vary with such factors as type shelter (existing, or canvas, or both), the terrain, the road net, and the available space. Furthermore, unlike the evacuation hospital in which all departments constitute one unit, the integrity of the mobile surgical unit permits it to close and move without disrupting the hospitalization units.

In arranging the surgical hospital the following principles are most important:

Only such elements for which a definite need is foreseen are established initially.

Facilities for receiving patients are located adjacent to the road from the clearing station.

The mobile surgical unit or such of its elements as may be established initially is located proximal to the receiving department with its service elements convenient to it but opposite the hospitalization unit(s).

Hospitalization units are located adjacent to the mobile surgical unit, ward elements proximal to the operating rooms (vans or tents) of the surgical unit, service elements distal to the unit.

Other principles as for a mobile hospital.

Conventionally the arrangement of a surgical hospital is roughly triangular, the apex, receiving and hospital headquarters, being on a motor road, the surgical and hospitalization units forming the sides with their respective service elements on both flanks.

Establishing hospital. The hospital commander designates the locations of the units and the elements of each to be established. Acting upon his directives unit commanders in turn designate the exact location of the departments for which they are responsible.

In the *erection of tentage* and the installation of equipment for those departments designated for initial operation, unit commanders utilize routinely the personnel of temporarily inactive elements. Routine procedures for priorities and methods of establishing departments are the responsibility of the unit commanders subject to the approval of the hospital commander.

Sources of Patients. Patients are evacuated from: The clearing station of which the hospital is in direct support,

Other clearing stations conveniently located,

In emergencies, aid and collecting stations. In this event, the records of patients admitted must be cleared through the proper clearing station.

Operation. During operations the headquarters:

Coordinates the functioning of the various units of the hospital.

The units or elements thereof being separated, maintains control of their operation unless such elements are attached temporarily to another medical unit.

Makes such reports and returns regarding patient and duty personnel as may be required by higher authority.

Maintains liaison with the division surgeon and with the commanders of clearing elements of the division medical unit regarding future probable and possible movements of clearing installations; type and number of expected casualties, especially the non-transportables; and the transportation of casualties from the clearing station(s) to the surgical hospital.

Maintains liaison with the army (or corps) surgeon regarding condition and movements of the hospital, medical supplies, and support by additional surgical teams from the auxiliary surgical group, and evacuation service by ground or airplane ambulance units.

Contacts assistant chief of staff G-4 (army or division) regarding transport for contemplated movements.

Contacts appropriate units of the Quartermaster Corps regarding disposal of salvage and the remains of personnel dying within the installation.

The scope of the *receiving department* is more limited than is that of its prototype in the evacuation hospital. The number of patients is less and nearly all cases admitted are seriously wounded and are admitted directly to the preoperative section of the mobile surgical unit. The same medical records are initiated (see FM 8-45), patients' identification tags being utilized as a source of information in the unconscious cases. Clothing and equipment are disposed of as outlined in the above references.

Personnel for the operation of the receiving department are furnished by the hospitalization unit actually receiving the patients admitted.

Patients' valuables are removed, listed, receipts placed in the appropriate field medical jacket, and the containers (sealed envelopes properly identified) held in the unit headquarters to be turned over at the proper time to the officer in charge of the evacuation of cases from that particular unit.

The bulk of the patients admitted are sent to the surgical unit for various surgical procedures, others are admitted directly to wards as not requiring such procedures or for supportive treatment prior to their being undertaken.

In the absence of the receiving officer, a noncommissioned officer from the hospitalization unit may be stationed with the surgical unit to designate the proper ward assignment as patients leave the operating rooms.

Property exchange is accomplished by the supply officer of one of the hospitalization units or his representative.

Registrar's Office. If both hospitalization units are active at the same location the two registrars combine their offices and submit indicated reports and returns for the installation rather than for both units. If operating independently the registrar of each unit maintains an office for that unit. (FM 8-45).

Surgical Service. In the normal situation, the mobile surgical unit is charged with all major surgical procedures. Patients sent to the unit are examined carefully and distributed to the functional elements of the unit (X-ray and operating rooms) for indicated procedures. Cases arriving in the wards from the surgical unit become the responsibility of the personnel of the hospitalization unit(s). Post-operative care beyond the capabilities of the ward personnel is rendered by the technical section of the hospitalization unit, or when necessary by such personnel of the surgical unit as the shock team. The personnel of the surgical unit will not become so involved in routine ward treatment that the unit itself becomes immobilized.

X-ray Department. Same as for the mobile hospitals.

Wards. All wards are established and operated by the ward sections of the hospitalization units. Particular sections or wards thereof may be designated to receive certain type cases such as head, chest, fractures, etc. The section personnel is sufficient for the apportionment of one medical officer to each two wards, and two nurses, a corporal, and five privates, first class, or privates (technicians and ward attendants) to each ward.

The operation of the wards is similar to that of wards in the evacuation hospital.

Evacuation of Cases. The officer in charge of each ward section prepares a list of

cases which are suitable for evacuation. Reports are made at required intervals to the unit or hospital headquarters and such headquarters in turn notifies section commanders of the arrival of evacuating elements. An officer designated by the hospital (or unit, if operating independently) acts as the evacuation officer.

The unit supply officer is charged with the property exchange.

Disposition of Patients. The bulk of the patients are evacuated by ground ambulances to evacuation hospitals. In certain situations, appropriate cases are evacuated to general hospitals in the communications zone by airplane ambulances.

Deaths. The death rate is high because of the type cases handled.

Movement of Installation. A surgical hospital closes (suspends admission of new cases) ordinarily when the clearing station(s) it is supporting moves to a new location. The hospital is cleared as rapidly as suitability of patients for evacuation and the facilities of the army evacuating elements permit. When the total number of patients decreases sufficiently, hospitalization units or elements thereof are cleared by grouping remaining cases, thus allowing personnel and matériel to be withdrawn piecemeal and moved to a new location. So long as any nontransportables remain, personnel and matériel necessary for their care must remain in position, even though this may result in capture.

Administration. Each unit submits a *morning report* of duty and patient personnel to hospital headquarters which in turn forwards a consolidated report to army headquarters while in the army service area, otherwise to the headquarters of the division whose medical service it supports. *Other reports* concerning patient admissions, evacuations, deaths, etc., are forwarded to the army surgeon as required.

In the event that a unit of the hospital is operating independently, such reports are submitted directly to the appropriate headquarters.

Operating independently the supply officer of each unit draws *class I supplies* for his unit from the appropriate distributing point within the division area. If all units of the hospital are grouped, the hospital commander designates one unit supply officer to draw for the entire hospital.

In emergencies *medical supplies* may be brought forward by the transport of army ambulance units, or may be drawn in limited amounts from the division medical supply reserve.

Other supplies are obtained as for other mobile hospitals.

First echelon motor maintenance is accomplished by the transport elements of each unit.

Second echelon motor maintenance is accomplished by the transportation group of the mobile surgical unit, or if the latter is not available to the hospitalization unit(s), by appropriate ordnance units operating in the vicinity.

Third fourth and fifth echelon motor maintenance is accomplished by ordnance units designated by G-4 (division or army).

When not at station the hospital commander designates one of the hospitalization units to furnish personnel and equipment for the operation of a dispensary for the *care of the hospital personnel*. When at station *sick and injured* personnel are reported to the receiving department for appropriate action.

Purpose, composition, general use. The purpose of the field medical record, composed of the field medical card, Form 52c, M. D. (see Plate 3), and field medical jacket, Form 52d, M. D. (see Plate 4), with such inclosures as are herein authorized, is to furnish a brief consecutive history of each patient in a theatre of operations in time of war, and during maneuvers or other field operations in time of peace, who is treated in hospital. The card will not, however, be used as a clinical history sheet, for this would result in all the available space being used and none being left for recording the basic data for which the record is intended. This record will be used at all times by surgical and evacuation hospitals. In a theatre of operations, registers of sick and wounded will not be maintained; therefore the field medical record rather than the register card, Form 52, M. D., will be used by station, general, and convalescent hospitals in this situation.

Received at (hospital and location):	Date
Changed and additional diagnoses, operations, with dates:	
Disposition:	Date
10-10960	
Signature of Surgeon.	
Received at (hospital and location):	Date
Changed and additional diagnoses, operations, with dates:	

Last name	First name	Initial
Army serial No.:		Grade
Company	Regiment and arm or service	Division
Age	Race	State
Service	Source of admission	
Received at (hospital and location):		Date
Diagnosis:		
Line of duty:		
Changed and additional diagnoses, operations, with dates:		
Disposition:	Date	
10-10960		
Signature of Surgeon.		
Received at (hospital and location):	Date	
Changed and additional diagnoses, operations, with dates:		

Disposition:	Date
Signature of Surgeon.	
Received at (hospital and location):	Date
Case closed on this form and taken up on Form 22 M. D.	Register No.
Date	

INSTRUCTIONS

Used as a brief consecutive record of a patient in a theater of operations and during peace-time field operations. Not to be used as a clinical history. Initiated at first hospital to which patient is admitted (station and general hospitals in a theater of operations; all surgical, evacuation, and convalescent hospitals; not used by medical regiments, battalions, or squadrons in combat, but used at other times when operating stations furnishing definitive treatment). Remains with patient, enclosed in field medical jacket, attached to patient during transport. Forwarded with sick and wounded report when case is completed. Closed upon receipt at hospital of definitive treatment in zone of interior in time of war and forwarded immediately to Surgeon General.

If space on one fold is insufficient, continue entry into next fold. If one card is inadequate, continue the record on a second card, or a third, and so on, marking the cards as first card, second card, etc. Each additional card used must bear complete identification of the individual.

U. S. GOVERNMENT PRINTING OFFICE 10-10960

FORM 52 C
MEDICAL DEPARTMENT, U. S. ARMY
(Revised March 18, 1941)

Disposition:	Date
Signature of Surgeon.	
Received at (hospital and location):	Date
Changed and additional diagnoses, operations, with dates:	
Disposition:	Date
10-10960	
Signature of Surgeon.	

Plate 3. Field Medical Record: The Field Medical Card, Form No. 52C, M. D.
The Field Medical Card is folded and inserted in the Field Medical Jacket.
M M M (4)

Where started, contents, matters to accompany. The record will be started for each case at the first of the hospitals mentioned above where definitive treatment is furnished. Immediately upon admission to hospital, the army serial number and name will be entered on the first fold of the card and on the outside of the jacket in the spaces provided. The Emergency Medical Tag and any other clinical record of value received with the patient, will be inclosed in the jacket along with the newly started field medical card. Other data for which space is provided, such as rank, company, regiment, etc., will be entered as soon as possible.

NOTE.—To be securely tied to patient's clothing over breast. To contain field medical card and any other clinical record relative to patient.

Army Serial No. _____

Surname _____ Christian Name _____

Rank _____ Co. _____ Regiment or Staff Corps _____

Date of first admission to sick report _____

Diagnosis (brief) _____

Sick	Slight	Walking case
Wounded	Severe	Sitting case
Gassed		Lying case

(Strike out words not applicable.)

Special attention needed in transit, or other remarks: _____

Copy of this F. M. R. was forwarded with the S. & W. report of _____ Hosp. No. _____ for the month of _____ as required in cases on sick report longer than one month.

FORM 52d
MEDICAL DEPARTMENT, U. S. ARMY
(Authorized June 25, 1916.)

NOTE.—The inner retaining flap of the envelope must be raised before placing papers inside; then folded down over the contents to prevent them from dropping out. The outer flap will be folded over the opening as an additional means of protecting contents.

TRANSPORTATION MEMORANDA

(To order that the movement of patient from front to rear may be recorded chronologically, all transportation orders, such as Amb. Cars, Hoop, Trains, Hoop, Ships, Transports, etc., transferring patients from one hospital to another will make appropriate entries in the spaces provided below.)

Patient was transported

From _____ to _____ by _____
(Hosp. unit.) (Hosp. unit.) (Transp. organ.) (Date.)

From _____ to _____ by _____

From _____ to _____ by _____

From _____ to _____ by _____

Transferred _____ from Theater of Operations to _____
(Date.)

Zone of the Interior by _____
(Designation of ship, train, or other org.)

Departing from _____
(Hosp. or place.)

Arrived at _____ (Zone of the Int.)
(Date.)

and forwarded to _____
(Hosp. or place.)

by _____ for definitive treatment.
(Date.) (Designation of transp. or other org.)

Plate 4. Field Medical Record: The Field Medical Jacket, Form No. 52d, M. D.
Contains the Field Medical Card.

Disposition, additions, verifications, corrections. After the record is started it must always remain with the patient, either at his bedside when in hospital or attached to his clothing when in transit from one hospital to another until it is disposed of as prescribed herein. From time to time the necessary entries will be made on the card showing complications, intercurrent diseases, operations, and dispositions, with dates. Ward officers and attendants will verify, and correct when necessary, any entries on the record, particularly as to names, serial numbers and organization.

Disposition of records of completed cases. The record for each case completed, by return to duty or by death, in a theatre of operation in time of war or in maneuver hospitals of a mobile type in time of peace, will be removed at once and forwarded with the next monthly report of sick and wounded to the chief surgeon of the field force or to the surgeon of the department or corps area, for transmittal to the surgeon general.

Disposition of records of cases transferred to the zone of the interior. The field medical records will be attached to the clothing of each patient transferred from any hospital in a theatre of operations to a hospital in the zone of the interior,

and from any hospital of a mobile type for troops engaged in maneuver, or in the field to any fixed hospital. Each field medical record thus received will be removed at once and closed, and the record of the case taken up on the hospital register. Field medical records of patients evacuated from a theatre of operations will be closed when the patients reach hospitals where they are to receive definitive treatment; these records will be forwarded directly to The Surgeon General within twenty-four hours. Field medical records received at a fixed hospital from a mobile hospital in time of peace or in the zone of the interior in war will be forwarded to The Surgeon General with the next report of sick and wounded.

Abbreviations for use on the field medical record. The abbreviations listed in Chapter I are authorized for use on the field medical records. No additions to or deviations from this list of abbreviations will be permitted. Whenever such changes become necessary and are approved by the War Department they will appear as amendments in such subsequent reprints of regulations as may be issued from time to time.

Regulations regarding records of sick and wounded. Regulations to be consulted in connection with compiling and keeping records of sick and wounded will be found in AR 40-1025. Also see FM 8-45.

THE EVACUATION HOSPITAL

The evacuation hospital is an organic element of the army and is under the direct control of the army commander and such control and supervision of the army surgeon as he designates. A type army contains ten such units. The unit is commanded by the senior officer of the Medical Corps assigned thereto and present for duty.

Organization. The organization falls naturally into three divisions, the headquarters, and the administrative and the professional services, which are not subordinate command elements but rather a grouping of elements possessing related functions. The chain of command is from the hospital commander directly to the commander of the separate functional elements of the two major services.

Functions. Evacuation hospitals are mobile units designed to:

Provide, as near the front as practicable, facilities for major medical and surgical procedures in the care and treatment of all casualties.

Provide facilities for the concentration of evacuees in such numbers and at such locations that mass evacuation by common carrier can be undertaken economically.

Provide opportunity and facilities for the beginning of definitive treatment as early as practicable.

Continue the sorting of casualties, under conditions more favorable for observation, and to remove from the chain of evacuation such as are, or soon will be, fit for duty.

Prepare evacuees for extended evacuation to general hospitals at some distance to the rear.

Employment. See FM 8-5 and FM 8-15. Evacuation hospitals normally are not allocated to subordinate echelons. They are usually echeloned laterally in order to reduce distances from flank units, and this echelonment may correspond to the tactical or territorial organization of the army, that is, one or more evacuation hospitals may be established in rear of each corps or independent division, but such arrangement should not be regarded as a rule or a principle. Flexibility is an essential characteristic of medical service. Corps and division boundaries must not be considered as limiting the sources of patients for evacuation hospitals.

Headquarters. The headquarters under Tables of Organization consists of the unit commander and the enlisted men necessary to assist in the general administration of the unit and its installation. These enlisted assistants include the hospital sergeant major, 1 staff sergeant (chief clerk), 1 corporal (clerk), 2 buglers, 3 chauffeurs, 2 general clerks, 2 switchboard operators, and 1 stenographer.

If the unit is inactive the headquarters is conveniently located in the unit bivouac area, and if the hospital is operating it is located with the basic elements of the installation.

Unit Commander. The unit commander is directly responsible to the army commander or to the army surgeon, as is prescribed, for the administration, discipline, training, and operations of the unit in all situations. He makes such assignment of

personnel within the unit as deemed suitable for normal functioning, and inter-changes personnel between departments when such is indicated. Without undue interference as to details, he exercises such direction over his subordinates as will insure successful teamwork. He maintains liaison with the office of the army surgeon at all times regarding the condition, establishment, and movement of the hospital, its incoming patients, and its need for hospital trains, teams from the auxiliary group, ambulance elements, or a supportive surgical hospital. He makes continuous anticipatory planning for crisis expansion of his installation and for unexpected movements to front or rear.

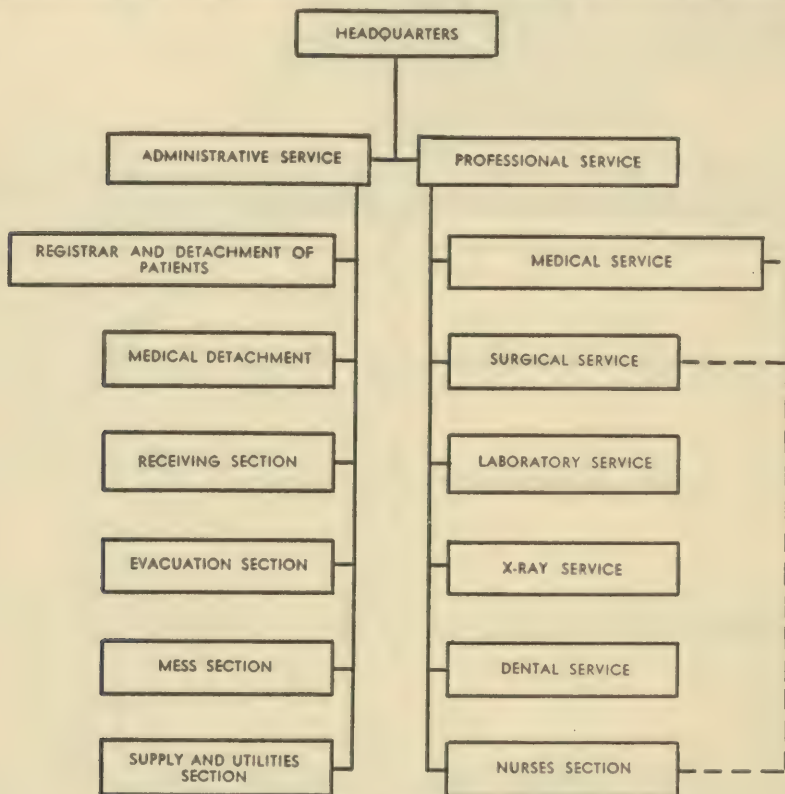


Plate 6. Organization of Evacuation Hospital.

During combat the evacuation hospital becomes the most vital link in the chain of evacuation. Through it pass all types of casualties, often in numbers which tax the capacity and the personnel to the utmost. The commander thereof must:

Insure the attainment of proper training objectives prior to the time his unit takes the field.

Establish policies regarding the various procedures involved in the establishment and operation of the hospital, and makes appropriate personnel fully acquainted with them.

Develop whenever possible a personal relationship with such individuals as the army surgeon and his staff, the medical regulator, and with those members of the army general and special staffs whose fields of activity include supply and evacuation.

Unit Staff. *The executive officer*, a medical officer, is the principal assistant of the commander and supervises the workings of the remainder of the staff. He must enjoy the confidences of the commander and possess a thorough knowledge of his policies and plans. He performs such routine administration of the unit and the hospital as does not require the personal action of the commander. In the latter's absence he makes such decisions as he thinks the commander would have made in like circumstances

and notifies him of such decisions at the earliest opportunity. Usually, in addition to his other duties, the executive officer is medical inspector (see AR 40-270).

The *adjutant*, a Medical Administrative Corps officer, functions as follows:

Conducts the principal office of record and keeps the diary (see AR 40-1005).

Acts as unit signal officer and in such capacity conducts the message center and arranges with the army signal service for suitable communications and for preferential priority on calls for evacuation.

Acts as assistant fire marshal.

For duties of the *Chaplain* (see FM 16-205).

The *personnel officer* is the assistant adjutant and is charged with the administration of all personnel matters except those retained by the medical detachment and the detachment of patients (see AR 345-5). It is suggested that the officer in the register and detachment of patients section be charged with this office. Collectively, his clerical assistants are designated the unit personnel section and are furnished from the detachment officers, supplemented if necessary by personnel of the unit headquarters.

The commander of the supply and utilities section in his capacity as unit *supply officer* is also a member of the unit staff.

Administrative Service. The officer in charge of the register and detachment of patients section is an officer of the Medical Administrative Corps and is directly responsible to the unit commander for the operation of his section. When the hospital is established, the office of the section commander is located adjacent to unit headquarters; if operating under canvas, in the same tent. His commissioned assistant may, at the discretion of the unit commander, be placed on duty in headquarters as the unit personnel officer. For a suggested assignment of enlisted personnel for this section, see Plate 5. The section commander acts in a dual capacity as—

The *registrar* is charged with the keeping of all records of the sick and wounded and the preparation of all reports and returns pertaining thereto, including the monthly report of sick and wounded (see FM 8-45).

The *commanding officer*, detachment of patients is charged with the keeping of all records and accounts, and the preparation of all reports and returns pertaining thereto, except for such as the personnel officer may be responsible and performs such other pertinent duties as may be required by higher authority.

The **Medical Department Personnel Section** constitutes the office of the medical detachment and the section commander is the commanding officer, medical detachment. He is an officer of the Medical Administrative Corps, and is charged with the discipline of the enlisted personnel of the unit, their duty assignments, the procurement and issue of their clothing and equipment, and so much of their training as may be delegated to him by the unit commander. He is responsible for such personnel administration as does not devolve upon the unit personnel officer. He commands the guard when this duty devolves upon the unit. In all situations he is directly responsible to the unit commander.

A suggested assignment of enlisted personnel to this section is shown in table above.

The *receiving section* consists of two officers of the Medical Corps, and certain enlisted personnel (see Plate 7). Nurses may be assigned for duty with this section. Its functions include:

Reception of incoming patients.

Examination and classification of patients and their assignment to service and ward.

Initiation of proper field medical records.

Checking of the patients' valuables and their safe-guarding until the patients are evacuated or returned to duty. Receipts for valuables are placed with the patients' attached medical records.

In accordance with existing policies, retaining the patients' clothing and equipment or turning them over to a representative of the supply department. If time and the situation permit, items of clothing and equipment are carefully listed and tagged with the man's name and organization. Whether such items accompany the patient if he is evacuated again depends upon existing policy and the exigencies of the situation.

Issuing of hospital clothing to incoming patients.

Notation on patients' records of important omissions of treatment.

Delivery of the patients to the proper ward, section, or department.

Thirty-eight litter bearers are included in the unit organization. These for normal situations are equally divided between the receiving and the evacuation sections. However, in many situations the bulk of these bearers will be needed in one department. The entire group may be placed in charge of a noncommissioned officer to form a bearer pool which may be drawn upon by section commanders in accordance with existing needs.

The *Evacuation section* consists of two officers of the Medical Corps, certain enlisted

1	2	3	4	5	6	7	8	9
1 Grade and Specialty	Head-quarters	Register and Detachment of Patients	Medical Department Personnel Section	Receiving Section	Evacuation Section	Mess Section	Supply and Utilities Section	Total
2 Master sergeant including	1							1
Sergeant major (502)	(1)							(1)
3 First sergeant (585)		1						1
4 Technical sergeant, including								2
Mess (824)						1		(1)
Supply (825)							1	(1)
5 Staff Sergeant, including	1							4
Chief clerk (052)	(1)	1						(3)
Mess (824)						1		(1)
Supply (821)							1	(1)
6 Sergeant, including								10
Mess (824)						3		(3)
Section leader (652)			1	1	1	1	1	(5)
Supply (825)							1	(1)
Utilities (822)							1	(1)
7 Corporal	1							12
Assistant section leader (652)			2	2	2	2	2	(10)
Clerk-typist (405)	(1)							(1)
Motor (813)							1	(1)
8 Technician, grade 3								
9 Technician, grade 4								
10 Technician, grade 5								
11 Private, first class	10							148
12 Private								
13 Baker (017)						1		(1)
14 Bugler (803)	(2)							(2)
15 Butcher (037)						1		(1)
16 Carpenter (060)						1		(1)
17 Chauffeur (344)	(1)							(1)
18 Chauffeur (345)	(2)		1	1	1	1	1	(7)
19 Clerk, general (055)	(2)	3	8	4	4	2	1	(19)
20 Clerk, stock (324)							3	(3)
21 Cook (060)						24		(24)
22 Cook's helper (521)						16		(16)
23 Electrician (078)							1	(1)
24 Litter bearer (657)				19	19			(38)
25 Mechanic, automobile (014)							1	(1)
26 Operator, electric plant (077)							2	(2)
27 Repairman, utility (121)							1	(1)
28 Stenographer (213)	(1)	1	1					(3)
29 Switchboard operator	(2)							(2)
30 Technician, sanitary (196)				2	2			(4)
31 Typist (247)		1	1	1	1			(4)
32 Basic (521)		4	4			2	7	(17)

Plate 7. Suggested Assignment of Enlisted Personnel, Administrative Service, Evacuation Hospital.

personnel and nurses as the situation indicates. The section commander who is the unit evacuation officer is directly responsible to the unit commander. The functions of this section include:

Act with or for the unit commander in all matters concerning evacuation which demand correlation with the army surgeon or the appropriate member of the latter's staff.

Assume charge of all evacuation ward tents and the treatment of the patients therein pending their further evacuation.

Give due notice to ward surgeons and chiefs of services regarding the arrival and

departure of evacuating units (trains, airplane or motor ambulance units), and keep a running tabulation on the number, type, and location of patients deemed fit for immediate evacuation.

Collect and make appropriate entries on the medical records of all outgoing patients. Obtain from the receiving section and deliver to the evacuating officer any valuables previously deposited for safekeeping by patients being evacuated.

Check the clothing, hospital or otherwise, of outgoing patients for completeness and suitability.

Furnish personnel for the movement of patients from the various wards to the transport of the evacuating unit and for the actual loading of the patients, except in the case of airplane ambulances.

Prepare a tally sheet of outgoing patients during the loading, furnish one copy to the receiving officer (of the evacuating unit), and obtain the latter's signature on another copy as a receipt for the patients being evacuated.

Act in case of deaths as prescribed according to regulations.

The evacuation section operates in building(s) or tents adjacent to the track or motor road utilized by the evacuating unit. This usually places the section in the rearmost portion of the installation and directly opposite the receiving section. The amount of space or tentage occupied depends upon the existing needs.

The *mess section* consists of an officer of the Medical Administrative Corps, one dietician (civilian employee), and certain enlisted personnel.

The general *functions* of the mess officer and his section are to:

Procure from the unit supply officer, store and issue all food supplies.

Operate three messes, one for the officers and nurses, the patients, and enlisted personnel.

Provide hot liquid nourishment for the shock wards on call.

Pack and load all mess canvas and equipment when the installation moves.

Act as custodian of the mess fund.

The messes are located near the active wards for convenience of all concerned. A suggested location if the unit is operating under canvas, is shown in Plate No. 7.

The *supply and utilities section* consists of the following personnel: the section commander who is an officer of the Quartermaster Corps, one commissioned assistant of the Medical Administrative Corps, and certain enlisted personnel. To facilitate the execution of the various functions of the section, it is suggested that the personnel be divided into three groups, supply, utility, and transportation. The section commander is responsible for the operation of all groups but may delegate the actual management of any group(s) to his assistant. Ordinarily the assistant is charged with the management of the supply group, although the section commander as unit supply officer retains all accountability.

In addition to being section commander this individual functions in several roles, in each of which he is directly responsible to the unit commander. As unit supply officer he is a member of the unit commander's staff and advises him in all matters pertaining to supplies and equipment. In this capacity he is charged with:

Procurement, storage, and issue of all supplies required by the unit or its installation. Maintenance of the only stock record account within the unit.

Accountability for all property issued to the unit until such time as property accountability may be suspended.

Collection and proper disposal of all salvage within the unit.

Conduct of the laundry exchange.

Conduct of the property exchange. Although such function may be considered as within the purview of the receiving and evacuating officers, all property exchange is handled by the supply group. Pyramidal tents are erected near the receiving and evacuating departments (see Plate 7), and supply personnel stationed there to conduct such exchange with incoming ambulance and outgoing evacuating elements, respectively.

Disposition of patients' clothing and equipment. The clothing of an enlisted patient, if serviceable, is tagged for identification and returned to him upon his departure from

the installation (duty or further evacuation). If the clothing is unserviceable, it is turned over to the supply officer for disposition and the enlisted man is issued available serviceable clothing upon his departure. All items of individual equipment which have accompanied the enlisted patient to the evacuation hospital are turned over to the supply officer who in turn gives them to the representatives of the nearest quartermaster company (salvage collecting) for disposition. Clothing of officer patients invariably is held and accompanies them if evacuated to the rear.

Usually the section commander in addition to his other duties is designated *unit fire marshal*. In this capacity he is charged with the enforcement of such fire-prevention measures as may be prescribed by the unit commander or higher authority, the formulation of regulations for the conduct of personnel in case of fire, and with the conduct of periodic fire drills.

Professional Service. The professional service represents a grouping of certain functional elements of the hospital and is not an organic element of the unit.

1	2	3	4	5	6	7
Grade and Specialty	Medical Service	Surgical Service	Laboratory Service	Roentgenological Service	Dental Service	Total
2 Technical sergeant, including	---	---	---	---	---	2
Laboratory technician (858)	---	---	1	---	---	(1)
Pharmacist (149)	---	---	1	---	---	(1)
3 Sergeant, including	---	---	---	---	---	4
Section leader (652)	1	1	1	1	---	(4)
4 Corporal, including	---	---	---	---	---	5
Assistant section leader (652)	1	1	1	1	1	(5)
5 Technician, grade 3	---	---	---	---	---	---
6 Technician, grade 4	---	---	---	---	---	---
7 Technician, grade 5	---	---	---	---	---	129
8 Private, first class	---	---	---	---	---	---
9 Private	---	---	---	---	---	---
10 Clerk, general (065)	1	1	---	---	---	(2)
11 Mechanic, orthopedic (366)	---	1	---	---	---	(1)
12 Pharmacist (149)	---	---	3	---	---	(3)
13 Stenographer (213)	---	2	---	---	---	(2)
14 Technician, dental (067)	---	---	---	---	6	(6)
15 Technician, laboratory (858)	---	---	5	---	---	(5)
16 Technician, medical (123)	44	---	---	---	---	(44)
17 Technician, surgical (225)	---	46	---	---	---	(46)
18 Technician, X-ray (264)	---	---	---	4	---	(4)
19 Typist (247)	1	1	1	1	---	(4)
20 Basic	4	2	2	2	2	(12)

Plate 8. Suggested Assignment of Enlisted Personnel, Professional Service, Evacuation Hospital.

Normally each service, medical, etc., is an independent element of the hospital and the chief thereof directly responsible to the unit commander. The commander may subordinate certain auxiliary service(s) to one of the major services. For example, the roentgenological service may be placed under the command of the chief of the surgical service, or the laboratory service under the chief of the medical service. These are command decisions and do not change the various functions of the services involved.

Organization. See T/O 8-580.

Functions. The professional service is responsible for the care and treatment of all patients admitted to the hospital from the time they are relinquished by the receiving officer until they are returned to duty or turned over to the evacuation officer for transfer to a convalescent or general hospital. The only exceptions to this rule are those cases requiring little or no immediate treatment which the receiving officer may admit directly to the evacuation wards.

The professional service is the basic functional element of the unit, and the headquarters and the administrative service merely furnish those aids necessary to permit the execution of appropriate procedures by that service.

Medical Service. The personnel include six officers of the Medical Corps (see T/O 8-580, assigned nurses, and 53 enlisted men.

In general, the service is responsible for the care and treatment of all medical cases within the installation, the safeguarding of their medical records and the making of appropriate entries therein, and the internal administration of such wards as may be designated medical.

In addition under combat conditions the service may operate a section for the care and treatment of casualties resulting from chemical agents or may be utilized to augment the surgical service.

Surgical Service. The personnel include 21 officers of the Medical Corps and 1 officer of the Dental Corps, including the chief of the service, assigned nurses, and 56 enlisted men.

The general functions of the surgical service include:

Care and treatment of all surgical cases within the installation, the safeguarding of such medical records as are kept on the wards and the making of appropriate entries therein, and the internal administration of such wards and other departments as may be designated surgical.

Operation of the following departments:

Bath, dressing room for slightly wounded, preoperative treatment (wards) shock treatment (wards); sterilizing room; and operating rooms (tents).

Surgical Teams. For the performance of special functions the bulk of the personnel of the surgical service are further organized into teams (See T/O 8-580).

Chief. The senior officer of the Medical Corps assigned to the surgical service and present for duty is the chief of the service and is directly responsible to the unit commander for the operations of the service. In situations other than combat he may actively engage in operative procedures. However, during combat his duties are the supervision and coordination of the work of his various departments, to assist the receiving officer in the proper disposal of questionable cases to act as surgical consultant at the request of the chief of the medical service, and to request through the unit commander needed surgical support.

The surgical service is supported by:

Augmentation by personnel of the medical service.

Attachment of surgical teams from the auxiliary surgical group.

Establishment of a surgical hospital adjacent to the evacuation hospital.

Attachment of the mobile surgical unit or portions thereof of a surgical hospital.

Laboratory Service. The personnel consists of one medical officer who is the chief of the laboratory service and 14 enlisted men. Ordinarily he is directly responsible to the unit commander for the operation of his service, although at the discretion of the unit commander the laboratory service may be subordinated to one of the major services, in which case he becomes responsible to the chief of the latter.

The service is responsible for the performance of such laboratory procedures as may be requested and are feasible such as urinalyses, blood counts, coagulation tests, blood typing, and other procedures calling for simple apparatus and short performance time, and for the performance of autopsies in indicated cases.

Requests for laboratory procedures requiring special apparatus, highly specialized personnel, or long periods of time for their performance are forwarded to designated laboratories within the communications zone.

In emergencies assistance is requested through the surgeon from the army laboratory.

Roentgenological Service. The personnel include two officers of the Medical Corps and 8 enlisted men. The senior is the chief of the X-ray service and is directly responsible to the unit commander or to the chief of one of the major services to which the X-ray service may be subordinated.

The X-ray service is responsible for the taking, the development, and the interpretation of such X-rays and the performance of such fluoroscopic examinations as may be requested and are within the capabilities of the personnel and equipment.

In addition it is responsible for the packing and unpacking, installation, operation,

care, and maintenance of all X-ray equipment. It makes minor repairs to such equipment, referring such as may be beyond the capabilities of its personnel to the army medical depot.

Dental Service. The personnel includes two officers of the Dental Corps, the senior being the chief of the dental service and 9 enlisted men. Ordinarily the service functions independently, the chief being directly responsible to the commander at his discretion may place the service under the direct command of the chief of the surgical service.

The dental service renders emergency dental treatment to the duty personnel and the patients of the hospital and in addition treats such dentosurgical cases as do not require the services of the plastic-maxillo-facial team. During combat the personnel may be utilized for such duties other than dental as the commander may deem necessary. For example, they may be utilized to augment the personnel of the receiving section or of some department of the surgical service.

Nurses. The unit personnel includes 52 nurses, of whom 6 are assigned to the administrative service and 46 to the professional service. The need for their services within the different departments of the installation will vary with the number and type of cases admitted and with the situation. It is suggested that the chief nurse be directly subordinate to the unit commander and that through her the other nurses be distributed for duty as best meets the existing needs. This system should not prevent certain key nurses such as members of surgical teams from remaining continuously with one department. Too much fluctuation hinders rather than promotes general efficiency.

Enlisted Personnel. In addition to the general qualifications included among the specialists of the unit almost every type pertaining to administration, utilities, and hospital technique. When the unit is at station and the capacity of the hospital strained, many enlisted specialists function with little or no supervision. Hence practically all must possess considerable intelligence and initiative and be highly trained in the execution of their particular duties. Particularly is this true of the professional specialists who are members of the various surgical teams and those on duty in the shock wards, preoperative and post-operative wards, and such departments as the dressing, X-ray, sterilizing and operating rooms.

Training. There being no plans and training officer on the unit staff, the actual management of individual training devolves upon the detachment commander. Acting within the policies and directives of the unit commander and subject to the latter's approval, he prepares the unit training programs and schedules, assigns instructors, and exercises general supervision. The unit commander in turn makes such training inspections as he deems necessary to insure the proper progress of training and the attainment of the prescribed objectives.

Group training is managed by the section and service commanders; unit training by the unit commander.

Both staff sergeants in the office of the registrar should be familiar with casualty records and returns and in the general administration of the sick and wounded.

Foreman, Utilities. One sergeant from the utilities group is trained in the supervision of the various utility specialists. Prior occupational experience in one or more of the pertinent specialties is highly desirable. Sufficient training in all to permit intelligent supervision is also necessary in as much as frequently he will exercise control over the whole group with little or no aid from the section commander or his assistant.

Mechanic Orthopedic. One private from the surgical service possessed of a moderate amount of mechanical ingenuity and the ability to handle tools applicable to metal and leather work is trained in the improvisation of orthopedic splints and appliances for cases in which standard items are neither suitable nor available. A brief apprenticeship served in the orthopedic shop of a general hospital is highly desirable. Otherwise, special training with the personnel of the splint teams is substituted.

Pharmacist. Should be qualified as senior pharmacy technician. Effort should be made to effect the assignment to this hospital of previously trained pharmacists.

Plumbers. Certain men from the utilities group must have a general knowledge of

the installation and repair of sanitary plumbing appliances and of hot water and steam heating systems. Prior experience as a pipe fitter or a plumber's helper is mandatory.

Technicians, Medical, Surgical and Laboratory. These technicians are trained in the special duties required by their particular assignment.

Technicians, X-ray. Under Tables of Organization one corporal and four technicians from the roentgenological service are trained in the packing, unpacking, installation, operation, care, and maintenance, and the making of minor repairs of the X-ray equipment; the taking and the development of X-ray plates; the operation and precautions in the use of the X-ray and the fluoroscope. Prior experience in X-ray work plus attendance at the appropriate service school is highly desirable.

Unit Training. All phases of training are important to the evacuation hospital unit, but none is so vital as the unit training. The amount of transport, motor or rail, necessary to transport the unit and its equipment demands thorough and systematic packing and loading. Upon the training of the unit as a whole depends the rapidity with which the hospital can be established and made ready for operation as well as closure and movement of the installation after it has been cleared of patients. The scope of the unit training includes—

Technical. Establishment and operation of the hospital in buildings, under canvas, or by utilizing a combination of the two, by day or by night and under varying weather conditions.

Logistical. Packing, unpacking, loading, and unloading of organizational equipment, movement by rail and by motor transport, and supply during operations.

Combined. Training with other units is possible only during large scale maneuvers and the responsibility for the planning and actual management rests with the army surgeon. The unit commander is responsible only for the operation of his own unit.

Installation. The unit establishes one evacuation hospital. The hospital has a normal capacity of 750 patients. To meet unusual demands the hospital may be expanded, the amount of such expansion depending upon equipment and supportive personnel available. The physical arrangement of the installation depends upon the following factors; establishment in existing shelter, under canvas, or both; the terrain; the relative location of roads from the front; and roads, railroads, or waterways to the rear. The extent of the installation is such that seldom will the ideal arrangement be possible, nor will the various factors in any two situations be identical. However, for a point of departure a suggested conventional arrangement under canvas is shown in Plate No. 9.

In arranging the ground plan and designating locations for the various departments, strict adherence to the following general principles is advised:

A basic unit is designated, including such departments as are needed for initial functioning, and is given first priority in the establishment of the hospital.

The receiving department and facilities for property exchange are located adjacent to the road from the front.

Such professional departments as the X-ray, bath, shock, and preoperative are not only grouped but are located in the vicinity of the receiving department for the purposes of economizing time and effort and minimizing the patients' discomfort incident to movement.

Service elements, except messing, are segregated for ease of control and are widely separated from wards containing critically ill or severely wounded patients.

Messing elements are located to promote ease in serving patients and duty personnel.

Evacuation department is located on railroad siding, motor road, or dock to be utilized by unit evacuating the installation.

Waste disposal area is given a leeward location.

Ground markers (Red Cross), if used, must occupy conspicuous positions.

Morgue is inconspicuously placed in a location where ingress and egress will be least noticeable to patients.

Proper separation of tents or buildings limits the fire hazard and permits the passage of bearers and vehicles.

Arrangement must permit crisis expansion.

permits coordination of loading and unloading (train or trucks), and insures early establishment of vital departments with an minimum time lag between arrival and the time the installation is ready for actual operation.

A conventional hospital plan and a priority list having been adopted, deviations therefrom are kept at an absolute minimum. The following order for the erection of tentage, also applicable to the establishment of departments in existing shelter, is suggested only as a guide (tent numbers refer to Plate No. 9):

Receiving wards (department), tents Nos. 1 and 2.

Preoperative wards, tents Nos. 8 and 9.

Shock wards, tents Nos. 15 and 16.

Bath department, tent No. 3.

X-ray and sterilizing departments, tent No. 10.

Dressing and dental departments, tent No. 4.

Operating rooms, tents Nos. 11 and 12.

Pharmacy and laboratory, tent No. 5.

Headquarters and registrar's office, tent No. 6.

Messes (including kitchens), tents Nos. 7, 14, and 21.

Basic wards medical surgical, tents Nos. 13, 17 to 20, inclusive, and 22 to 27 inclusive.

Latrines and screens in designated areas.

Quarters for personnel.

Remaining administrative offices, supply, and storage facilities.

Remaining wards.

Other sanitary installations.

With proper coordination of personnel canvas for several departments can be erected simultaneously. However, the completion of the basic unit or such part of it as the commander prescribes, together with the more important sanitary installations, takes precedence over the remaining priorities.

Distribution of Personnel. Based upon the markers, tentage and department equipment are appropriately distributed throughout the area, following which the detachment commander assembles all available men, organizes squads consisting of nine men, one a noncommissioned officer, and assigns to each squad the erection of particular tent(s). Squads of men from a particular section or service such as the mess section or service may be directed to erect the canvas of that department, and immediately to continue with the installation of the operating equipment of that department. Following the erection of the canvas of the basic unit a part or all of the bearer group is utilized as indicated to complete the project.

Each section and service commander or chief is charged with the installation of such equipment as pertains to his particular department(s). He inspects his equipment for serviceability, requesting emergency repairs as indicated, and draws any additional supplies required. When his department is prepared to operate he immediately notifies the unit commander or his designated representative.

Operation. Headquarters is located conventionally in tent No. 6 and is part of the basic unit. The unit (hospital) commander's office may be in the headquarters tent or if desired may be located in a small tent adjacent to headquarters:

Coordinates the functions of all departments, assigning wards to services, and re-distributing if necessary the personnel among departments to meet most equably the demands of the situation.

Makes such reports of admissions and dispositions as may be required by higher authority (normally a daily report is submitted to the army surgeon, stating the number of cases admitted and the number suitable for evacuation).

Maintains liaison with the army surgeon or his representative regarding evacuation by hospital train or other unit, medical supplies, equipment for expansion, support by other medical elements, and future movements of the installation.

Receiving Department. Every incoming patient is brought for preliminary examination, sorting and admission. Although conventionally located in tents Nos. 1 and 2, at times the influx will demand expansion into adjacent departments such as the dressing

tent and the preoperative wards. Every patient is examined by an officer. During stress periods only one of the two regularly assigned officers can be on duty in the department. Augmentation may be accomplished by temporary transfer of one or more officers from other departments, as from the dental service, to the receiving department. The chiefs of the medical and surgical services may help with examining and sorting. Every effort is made to determine the exact nature of the condition of each patient so that transfer between services after admission will not be necessary. If the influx is too great, secondary sorting may be accomplished in the dressing tent or in the preoperative wards.

An improvised office is established in tent No. 1 with the clerical personnel of the section (one staff sergeant, one sergeant, two general clerks, and one typist) organized to perform the following functions (see also FM 8-45):

The field medical record (M.D. Form No. 52c and d) is initiated for each case unless previously initiated as in a surgical hospital, and such notations entered thereon as directed by the examining officer. At the same time, an index card (M.D. Form No. 52a) is made and forwarded to the registrar's office. M.D. Form 53 may be substituted for 52a.

The EMT is removed from the patient, placed in the field medical jacket, and the jacket attached to the patient.

An officer receives and checks the patient's valuables, placing the receipt therefor in the field medical jacket. The valuables for each patient are sealed in a separate envelope, the latter clearly marked with the patient's name, organization, and serial number, and locked in a field safe or suitable substitute.

Clothing and equipment are removed, listed and stored, or turned over to the supply department for disposition in accordance with existing policies.

Each patient is issued hospital clothing and assigned to ward and service.

From the receiving department walking patients are directed and litter cases are carried by section personnel to one of the following destinations:

Dressing tent, bath tent, preoperative ward, X-ray ward, medical or surgical evacuation wards, shock ward.

Assignment of patients to particular wards within a service may be made in accordance with directives from the chiefs of the services. For example, the chief of the surgical service may designate particular wards for particular type wounds as orthopedic, chest, head, or abdominal cases; or for ambulatory and litter cases.

Exchange of such items of medical supply as splints, blankets, etc., accompanying incoming patients is accomplished by representatives of the supply department operating adjacent to the receiving department.

Located conventionally in tent No. 6, the office of the registrar is convenient to the unit headquarters and the receiving department. The personnel of this department receives the index cards from the receiving department. Together with information furnished by the wards and from the evacuation officer, the office prepares the report of sick and wounded as required from all hospitals in the theatre of operations. For further information regarding reports and returns see FM 8-45.

During operations the *surgical service* includes the dressing department, the bath tent, the sterilizing and operating departments, and the shock, preoperative, and other surgical wards. The personnel are distributed by the chief of the service to meet existing needs.

Dressing department tents located near the receiving department, receive for dressing and further sorting all ambulant surgical cases except those sent directly to the preoperative wards because of the obvious gravity of their wounds.

The officer in charge examines each patient carefully to determine the extent of the injury, administers prophylactic sera as indicated, dresses wounds, performs such minor surgery as may be indicated, and sends the patients to the proper wards. Those found with serious wounds are sent to the X-ray, the preoperative ward, or the operating room, as indicated.

The personnel varies with the situation and the distribution as made by the chief of the surgical service. Normally, one nurse and a surgical technician assist the officers in charge.

Equipment should include chairs or benches, two litters on racks for use as operating tables, bedside tables, basins, pails, water heater, and irrigators. Instruments and dressings are obtained from the sterilizing department as needed.

Bath Tent. The bath tent is an adjunct of the preoperative wards and is under the supervision of the surgical service. Normally, only surgical cases are sent there and then as a part of the preparation for operative procedures. The personnel consists of enlisted technicians supervised by male nurses. Cases are sent to the bath tent as admitted and clothing is removed and returned to the receiving department, and after bathing hospital clothing is furnished and the patients sent to the preoperative wards.

Equipment includes portable bath apparatus, water bags with attached hose and nozzles, litters on racks, rubber sheeting, blankets, soap, razors, water heater, and solutions for washing wounds.

Bathing facilities for appropriate gas cases are arranged in a separate department.

Preoperative Wards. Patients are received in the preoperative wards from the receiving office direct or through the dressing or bath tent. Each patient is again examined, particular care being taken to determine blood vessel or nerve injury, condition as to shock, the presence of tourniquets, uncontrolled hemorrhage, and the necessity for immediate surgical procedure or for supportive treatment prior to operation. Sound judgment and proper care and treatment in this department are vital for the successful operation of the surgical service. Close supervision by the chief of the service is indicated.

The equipment includes facilities for bathing, shaving, administration of sera, intravenous infusions, hypodermoclyses, enemata, transfusions, dressings, and allied functions.

The personnel should be carefully selected and changed only when absolutely necessary.

From the preoperative wards, patients are routed to:

Evacuation wards for fractures and other traumatism not complicated by open wounds and other cases operated on in clearing stations prior to admission who are in condition for immediate evacuation; Special wards for head, chest, abdominal, and shock cases, not yet ready for operation or evacuation; X-ray department; Operating rooms (tents), with the following priority: cases with active hemorrhage, those with tourniquet in place, and those with open unsplinted fractures.

Shock Wards. The shock wards are located adjacent to other surgical departments and receive patients from the receiving department, the preoperative wards, and from the operating room. Equipment is limited to that necessary to combat shock. Personnel comprises the special shock teams (see T/O 8-580). After response to treatment preoperative cases are sent to the operating room or to the preoperative wards; postoperative cases to surgical wards as indicated.

Sterilizing Room (Tent). This department sterilizes instruments, dressings, and operative packs for the entire service. Prepared package dressings are utilized to the fullest extent; otherwise, sheets, towels dressings, etc., are prepared for all types of cases. Likewise, instruments are sterilized in lots as indicated for particular procedures such as debridement, intestinal surgery, brain operations, etc. A nurse is in charge of the enlisted personnel. Liaison with the other surgical departments to correlate their needs is essential.

The operating rooms, identical in equipment, are located adjacent to the other surgical departments (see Plate No. 10). A conventional arrangement of the interior of an operating room or tent allows the simultaneous functioning of six specialist teams. Operating tables are litters on racks, and shelving along one side holds dressings, instruments, and scrubbing solutions. Tables between each two teams provide space for opening operative packs. One surgical nurse serves two operating teams, other nurses serve as operative assistants. One-way traffic is advised, patients are brought in at one end and removed through the opposite end. Personnel for the operating rooms are drawn from the surgical teams as indicated. All personnel should be relieved every 8 hours during periods of stress.

Patients are brought in by litter bearers and are placed on the vacant operating tables without being removed from their litters. Final preoperative preparation is accomplished and the anesthetic begun while the preceding case is being completed. An appropriate team performs the indicated procedure, one of the operators dictates a short resume of the procedure, and completes the report by adding the word DETAIN or EVACUATE. Cases to be evacuated are of two classes, those suitable for immediate evacuation and those requiring from 12 to 24 hours observation prior to evacuation. In determining whether patients should be detained or evacuated the operator is guided by the condition of the patient, the available space in the hospital, and the policy of the commander under the existing situation. Clerical personnel enter on the field medical records and clinical cards, preferably with ink or typewriter, such pertinent data as the name of the operator, the anesthetic, operative time, type operative procedure, the time intervening between incurrence and operation, and such observations as removal of foreign bodies. Records of patients dying in the operating room are completed and sent to the evacuation officer. Bed assignments are made by a noncommissioned officer who keeps a list of available beds. Litter bearers are on call at all times. Patients in shock are sent to the shock wards, detained cases to the basic wards, those temporarily detained to the secondary wards. Patients to be evacuated are sent to the evacuation wards as soon as they have recovered from the anesthetic.

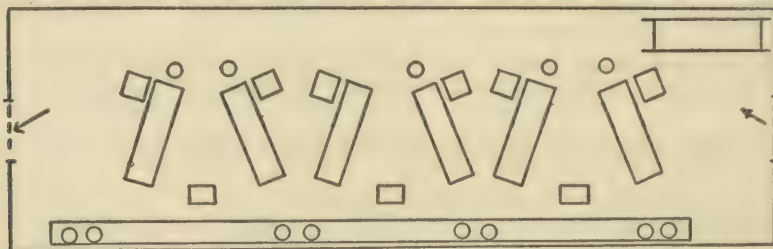


Plate 10. Conventional Arrangement of Operating Tent, Evacuation Hospital.

Operating time for each case may be estimated as $\frac{1}{2}$ hour. Thus one team working 8 hours can operate 16 cases. One team handling minor cases only can care for approximately 50 cases per 8-hour shift. On this basis plans for augmentation of the surgical teams can be made in advance of the actual need.

The X-ray department is adjacent to the preoperative wards and the operating rooms. Part of the room (tent) is converted into a dark room for fluoroscopic examinations. Most cases are fluoroscoped, X-rays being taken only for those wounds requiring an accurate location of foreign bodies such as head and neck cases. Cases are handled without being removed from the litter whenever possible.

The officer or X-ray technician handling the case locates foreign bodies, dictating the findings to a clerk or typist. These remarks are transcribed on the clinical card and supplemented by sketches when such appear advantageous. A brief entry is made also on the field medical record. Occasionally, the operating surgeon is called to verify the condition before removal to the operating room. After X-ray examination the patient is returned to the preoperative ward or sent to the operating room as indicated. Those found negative for pathology and their condition otherwise permitting may be sent directly to the evacuation wards.

The dental department is located in the tent with the dressing room, and its personnel furnish emergency dental treatment to patients and duty personnel, handle minor maxillo-facial wounds (of insufficient severity to warrant handling by the plastic-maxillo-facial team), and in emergency augment the personnel of such other departments as the receiving and dressing departments.

The Laboratory and Pharmacy. Services are grouped together and one officer supervises the operation of both departments. The laboratory confines its procedures, if possible, to blood counts, unanalysis, blood typing, etc. More complicated procedures

are referred to supporting laboratory installations. The pharmacy functions in its appropriate capacity, limited by the supplies available.

Wards are apportioned to the services by the commander according to existing needs. Each service furnishes the ward personnel for its assigned wards. Nurses are apportioned to the chiefs of services and assigned by them in the most advantageous manner. Privates (basic or technicians) are assigned to wards and noncommissioned officers to groups of wards.

In addition to such special wards as preoperative and shock, there are 11 *basic wards*. These are distributed as indicated in the preceding paragraph.

In addition to those within the basic unit, there are 17 other wards which may be utilized for *secondary treatment or evacuation wards* as the situation indicates.

Such local reports may be instituted as periodic reports to the receiving department or to the chief of service as to available beds, reports to the registrar of admissions, available beds, patients suitable for evacuation, together with their classification (status, disease or injury, litter or ambulant, etc.)

When a call for *evacuation* is received by the ward officer, he verifies the suitability of patients for evacuation; marks them for identification; sends their clinical cards to the evacuation officer; and just prior to their evacuation, adjusts splints and dressings, checks clothing and blankets for suitability, and makes sure that the field medical record is properly attached to each patient.

The *morgue* is located inconspicuously under canvas and is large enough to accommodate four litters on racks, and should contain galvanized-iron cans, pails, rubber sheets, and sponges. One or two enlisted men are assigned to duty at the morgue. The responsibility for the morgue rests with the chief of the laboratory service.

The evacuation officer, upon being notified of a death within the installation, obtains the field medical record and the clinical card (no prescribed form) of the deceased, closes them, and sends them to the registrar. The registrar, in his capacity of commanding officer of patients, with the ward (or department) officer, secures the personal belongings and the valuables of the deceased, inventories them, and transmits them to the unit supply officer. The body, properly tagged for identification, is removed to the morgue and prepared for burial. Final disposition of the remains is a function of the unit supply officer or a representative of the Graves Registration Service if one is attached to the unit. The registrar is responsible that report of death is forwarded to higher authority in accordance with existing regulations. (See TM 8-260.)

Evacuation Department. Patients may be admitted directly to the evacuation wards when their condition warrants their evacuation. Other patients are moved by the evacuation department directly from medical or surgical wards to the transport of the evacuating unit.

Upon receipt of information that a certain unit is to evacuate patients at a certain time, the evacuation officer notifies all wards that may have patients suitable for evacuation. Ward officers immediately furnish the evacuation officer with a list of such patients and shortly before loading time he dispatches bearers to the wards indicated for the movement of evacuees to the loading platform. As they are placed there, the evacuation officer or his representative rechecks all patients for suitability of clothing, checks the attached field medical records for presence and completeness, prepares a list of patients who have valuables deposited in the hospital (from receipts in field medical records) and obtains same from the receiving officer, and at the proper time turns such valuables over to the officer in charge of the unit receiving the patients. After checking the field medical records, clerks stamp them EVACUATED and add the designation of the evacuating unit and the date, and enter on a tally sheet a check for each patient being loaded. This tally sheet (two copies) becomes, when signed by both, a list for the officer of the evacuating unit and a receipt for the evacuation officer of the hospital.

Patients being evacuated by hospital train or truck convoy are loaded by the personnel of the evacuation department of the hospital. If the patients are being evacuated by airplane ambulances, the loading thereon is performed by the personnel of the medical battalion, airplane ambulance.

Property exchange with the evacuating officer is handled by representatives of the supply officer.

Disposition of Patients. Patients fit for full field duty are discharged from the hospital, marked duty, and are taken over at the hospital by representatives of the nearest replacement depot.

Patients requiring no further treatment but who will be fit for full field duty within a reasonable length of time are transferred to a convalescent hospital.

Patients requiring definitive treatment that can not be rendered in an evacuation hospital, or who will require lengthy hospitalization, or who, when hospitalization is completed, will be unable to perform military duty, are transferred to a general hospital within the communications zone.

Movement of Installation. When a functioning hospital is directed to close and move, all patients are segregated in the evacuation wards. As soon as a tent is cleared of patients, the equipment is packed and the tent struck. The detachment commander is in charge of the packing although each section or service commander supervises the packing of the equipment of his particular department. Dismantling normally proceeds in the following sequence:

- Basic unit (less messes and the headquarters).

- Secondary wards.

- Evacuation wards.

- Headquarters and other administrative offices.

- Quarters for personnel.

- Messes.

- Sanitary installations.

Properly trained, the unit should be able to establish the installation in from 4 to 6 hours and dismantle and move in from 8 to 10 hours after being cleared.

Movement of the unit with equipment requires approximately two-thirds of a type A train, or 184 truck-tons in addition to its integral transport.

Administration. Unit headquarters submits morning reports and other personnel reports and returns to army headquarters through the army surgeon or as directed. To obtain the proper amount of rations, a similar report of patients hospitalized is also rendered.

Class I supplies are automatic. They are drawn daily by the unit supply officer at a designated distributing point in the army service area. The unit supply officer in turn issues them to the mess officer.

Medical Supplies are obtained from the army medical depot in one of the following ways: by requisition through the army surgeon, by drawing upon established credits, by informal memorandum which also must be approved by the army surgeon. Delivery of medical supplies is accomplished by sending unit transport directly to the depot, by shipment from the communication zone to the nearest railhead or to the siding adjacent the installation, or in emergencies by the transport of the depot.

Other Supplies are obtained by requisition through the army surgeon on the nearest depot of the branch concerned.

First Echelon Motor Maintenance is performed by the transportation group of the supply and utilities section. Second and third echelon motor maintenance are by appropriate designated ordnance units of the army service area.

When not at station, personnel of the medical service operate a dispensary for the care and treatment of the *sick and injured* personnel of the unit. When at station, sick and injured personnel are reported to the receiving department.

EVACUATION HOSPITAL, MOTORIZED

The evacuation hospital, motorized is an organic element of the Army. It is designed to perform the functions of either the evacuation hospital (T/O 8-580) or the surgical hospital (T/O 8-570) and may replace either or both in the Army medical service.

[illegible]

Plate 11. T/O 8-581, Evacuation Hospital, Motorized.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Unit	Technician grade	Headquarters	Medical service ^a	Surgical service ^b	Eye, ear, nose, and throat service ^c	Orthopedic service ^d	X-ray service ^d	Laboratory service ^d	Dental service ^e	Convalescent section ^f	Detention section ^g	Total	Enlisted cadre	Remarks
Colonel.....		1										1		
Lieutenant colonel.....		1										1		
Major.....		1	1	1	1	1	1	1	1	1	1	3		
Captain.....		1	1	1	1	1	1	1	1	1	1	13		
First lieutenant.....		1										6		
Second lieutenant.....		1								6		7		
Total commissioned.....		8	2	3	2	1	1	1	4	7	2	31		
Master sergeant, including.....		1										1		
Sergeant major (502).....		(1)										(1)		
First sergeant (585).....		1										3		
Technical sergeant, including.....		1										1		
Clerk, chief (052).....		(1)										5		
Mess (824).....		(1)				2						(1)		
Pharmacist (149).....		(1)				(1)						(1)		
Supply, medical (825).....		(1)				(1)						(1)		
Technician, laboratory (469).....		(1)				(1)						(1)		
Staff sergeant, including.....		1								6	1	8		
Clerk, general (055).....		(1)										(1)		
Section chief (539).....		2								(6)	(1)	(7)		
Sergeant, including.....		(1)								12	2	18		
Clerk, admission (055).....		(1)				2						9		
Medical (673).....		(1)								(6)	(1)	(7)		
Mess (824).....		(1)				(2)				(6)	(1)	(7)		
Motor (813).....		(1)								(6)	(1)	(7)		
Corporal, including.....		2								12	1	15		
Dispatcher (410).....		(1)										(1)		
Medical (673).....		(1)								(12)	(1)	(13)		

^a Includes 1 major, M. C., chief of medical service (internist); 1 captain, M. C., assistant chief (internist).

^b Includes 1 major, M. C., chief of surgical services (general operator); 1 captain, M. C., assistant chief (general operator); 1 lieutenant, M. C., anesthetist and assistant surgeon.

^c Includes 1 captain, M. C., chief of service (otorhinolaryngologist); 1 lieutenant, M. C., assistant chief (ophthalmologist).

^d Includes 1 captain, M. C., chief of service (prosthetist); 2 lieutenants, M. C., (general clinical dentistry); 1 lieutenant, D. C. (oral surgeon).

^e Physical rehabilitation section (6 convalescent campmates, includes 1 captain, M. C., chief of section, 6 second lieutenants, M. A. C., and 10 enlisted campmates).

^f Personnel for control and treatment of venereals, includes 1 captain, M. C., chief of section (urologist); 1 lieutenant, M. C. (urologist).

^g Medical inspector and executive officer.

^h Commanding officer, detachment of patients.

2 Medical Administrative Corps; 1 Quartermaster Corps; 1 chaplain.

3 Medical Administrative Corps.

Distribution of personnel indicated herein is advisory. Considerable variation therefrom is left to the discretion of the commanding officer of the hospital.

The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.

20	Supply, medical (825)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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Plate 12. T/O 8-590. Convalescent Hospital.

[A. G. 320.2 (6-10-42).]

CONVALESCENT HOSPITAL

The convalescent hospital, an independent unit, is an organic element of the army and is under such control of the army surgeon as the army commander designates. A type army contains one such unit.

As in the case of the surgical and evacuation hospital this unit is commanded by the senior officer of the Medical Corps assigned thereto and present for duty.

Organization. See T/O 8-590. The general organization is designed to permit expansion to meet unusual requirements.

Functions. The convalescent hospital renders care and treatment to cases whose nature does not warrant definitive treatment in an evacuation hospital and whose duration and prognosis do not warrant transfer to a general hospital. Such cases include:

Convalescent cases from evacuation hospitals who will be fit for full field duty within a reasonable length of time.

Venereals, by transfer or direct admission.

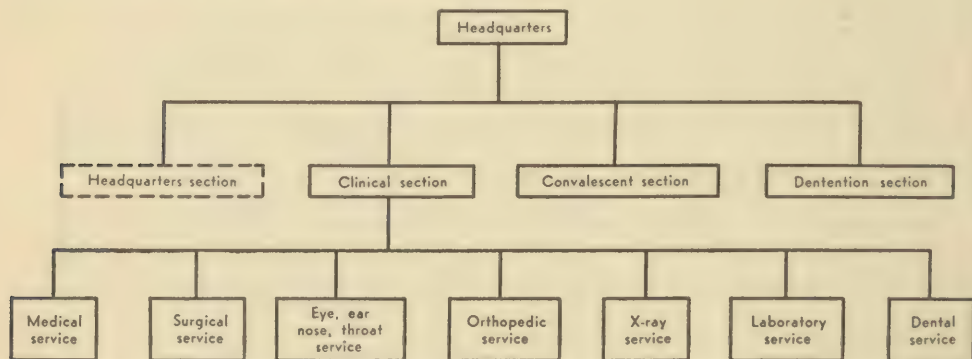


Plate 13. Functional Organization of Convalescent Hospital.

Cases other than venereal, by direct admission from army (corps and division) clearing stations and from dispensaries operated by medical personnel attached to various units operating in the vicinity of the hospital such as the replacement depot.

Headquarters. The hospital headquarters consists of the hospital commander and the enlisted assistants necessary for the operation of headquarters and the administrative functions incident to the operation of the hospital. The number of such assistants make it advisable to form a headquarters section. See Plate 12, Organization of convalescent hospital.

Headquarters section. A suggested functional organization of a headquarters section consists of:

Detachment headquarters:

- 1 First sergeant
- 1 Staff sergeant (clerk, general)
- 1 Sergeant (clerk, admission)
- 1 Technician, grade 5 (clerk, typist)
- 1 Private first class, or private (bugler)

Hospital headquarters group:

- 1 Master sergeant, sergeant major
- 1 Technical sergeant (clerk, chief)
- 1 Technician, grade 5 (clerk, general)
- 1 Technician, grade 5 (chaplain's assistant)
- 1 Private first class, or private (clerk, general)
- 1 Private first class, or private (stenographer)

Unit Supply and Utilities group:

- 1 Technical sergeant (supply, medical)
- 1 Corporal, (supply, medical)
- 1 Technician, grade 4 (pharmacist)
- 2 Technician, grade 5 (carpenter)
- 1 Technician, grade 5 (clerk, stock)
- 1 Private first class, or private (clerk, stock)
- 1 Private first class, or private (clerk, typist)
- 1 Private first class, or private (repairman, utility)
- 2 Private first class, or private (basic)

Unit transportation group:

- 1 Sergeant (motor)
- 1 Corporal (dispatcher)
- 1 Technician, grade 5 (mechanic, automobile)
- 11 Technician, grade 5, private first class, or private (chauffeur)
- 1 Private first class, or private (chauffeur)
- 1 Private first class, or private (basic)

Headquarters mess group:

- 1 Technical sergeant (mess)
- 3 Technician, grade 4 (cook)
- 4 Technician, grade 5 (cook)
- 2 Technician, grade 5 (baker)
- 1 Technician, grade 5 (technician, sanitary)
- 4 Privates first class, or private (cook's helper)
- 2 Privates first class, or private (baker)
- 2 Privates first class, or private (basic)

Location. The unit being inactive, the headquarters is conveniently located in the bivouac or camp area; the unit being at station, the headquarters is located within and near the front of the installation.

Commander. The hospital commander is directly responsible to the army commander or the surgeon, as prescribed, for the administration, discipline, training, and operations of his unit in all situations. While at station, he maintains close liaison with the army surgeon and his assistants, the commanders of active evacuation hospitals within the army area, and with the commander of the replacement depot to which cases are sent upon complete recovery.

Executive officer. The executive officer, an officer of the Medical Corps, is also the medical inspector. His duties are similar to the executive officer's duty of an evacuation hospital.

Supply officer. An attached officer of the Quartermaster Corps functions as the unit (hospital) supply officer. In addition to his supply duties, he also may be charged with utilities, transportation, the duties of fire marshal, and may command the headquarters section.

Adjutant. An officer of the Medical Administrative Corps is the adjutant and in addition may be charged with the duties of unit personnel and assistant fire marshal.

Chaplain. See TM 16-205.

Clinical Section:

Medical. Two officers of the Medical Corps, both internists, serve as chief and assistant chief. There is 1 sergeant (medical), 1 private first class, or private (clerk, typist), 1 technician, grade 4, 1 technician, grade 5; and 2 privates first class or private (technicians, medical).

Surgical. Three officers of the Medical Corps serve as surgeon and chief of service, assistant surgeon and assistant chief, and anesthetist. The enlisted personnel include 1 technician, grade 3; 2 technicians, grade 4; (all technicians, surgical), and 2 privates first class, or private (clerk, typist).

Eye, ear, nose, and throat. Two officers of the Medical Corps serve as chief of service and otorhinolaryngologist, and the assistant chief and ophthalmologist respectively. The enlisted personnel includes 2 privates first class, or privates, (technicians, surgical), and 1 private first class, or private (clerk, typist).

Orthopedic. One officer of the Medical Corps, the chief of service. Enlisted assistants include 3 technicians, grade 5 and 1 private first class, or private (all technicians, surgical), and 1 private first class, or private (clerk, typist).

X-ray. One officer of the Medical Corps, 1 technician, grade 4 and 1 technician, grade 5 (technicians, X-ray), and 1 private first class, or private (clerk, typist).

Laboratory. One officer of the Medical Corps, 1 technical sergeant (pharmacist), 1 technical sergeant (technician, laboratory), and 2 technicians, grade 5 (technicians, laboratory).

Dental. Four officers of the Dental Corps including the chief of the dental service a captain (prosthetist), 2 lieutenants (general clinical dentistry), and 1 lieutenant (oral surgeon). Enlisted assistants include 1 technician, grade 4 and 3 technicians, grade 5 (all technicians, dental), and 1 private first class, or private (clerk, typist).

Additional. One sergeant and 3 privates first class, or privates (basic) form a utility squad and act as replacements and reinforcements for the various services.

Functions. The clinical section operates:

Receiving office for the hospital.

Dispensary for the treatment of convalescent patients and duty personnel.

Clinics and departments wherein the special functions of the various services are accomplished such as operating room, X-ray clinic, pharmacy, etc.

Ward for the care and treatment of sick and injured duty personnel and of hospital patients whose condition is such as precludes assignment to the convalescent or detention sections.

Other functions as may be assigned by the hospital commander.

Convalescent Section. This section is provided to furnish care, treatment, and physical rehabilitation to convalescent patients. It is capable of caring for approximately 1800 patients. The section is commanded by a captain of the Medical Corps, who is chief of section, and includes six second lieutenants of the Medical Administrative Corps. The enlisted personnel includes six staff sergeants (section chief), twelve sergeants (six medical and six mess), twelve corporals (medical), six technicians, privates first class, or privates (chauffeurs); twelve technicians, grade 4 (cook); twelve technicians, grade 5 (cook); twelve privates first class, or privates (cook's helper); and seven privates first class, or privates (basic).

The section personnel provides cadres for six companies each consisting of one second lieutenant of the Medical Administrative Corps, one staff sergeant (section chief) one sergeant (mess), two corporals (medical), one technician, private first class, or private (chauffeur), four technicians, privates first class or privates (cook) and two privates first class, or privates (cook's helper).

Detention Section. The personnel of the detention section includes those for control and treatment of venereals. The two officers of the Medical Corps are both urologists. A captain is chief of the section and he is assisted by a first lieutenant. The enlisted personnel includes one staff sergeant (section chief), two sergeants (one medical and one mess), one corporal (medical), two technicians, grade 4 (cook), two technicians, grade 5 (cook), two privates first class, or privates (cook's helper), one private first class or private (clerk, typist), one technician, grade 4 (technician medical), one technician, grade 5 (medical), three privates first class or privates (technician, medical), three privates first class, or privates (technician, surgical); and two privates first class, or privates (basic).

The cadre divides itself functionally into two groups, an administrative and a treatment. The former contains the personnel for forming a varying number of companies. The technical specialists form the treatment group but may be utilized also for administrative purposes. The officers function in both groups.

Functions. The care, treatment, administration, and control of all venereals admitted to the hospital.

Enlisted Personnel. The qualifications of the enlisted personnel of the convalescent hospital are analogous to those required for similar personnel of the evacuation hospital.

Training. Training in this unit parallels that of the evacuation hospital.

Installation. The unit establishes one convalescent hospital.

Capacity. The hospital has a normal capacity of 3000 patients and can be expanded to accommodate 5000 for a period not to exceed 1 week.

Location. (see FM 8-15). Usually located centrally but well to the rear of the army area in a place that is convenient to evacuation hospitals and army replacement units. It may be located in rear of the army rear boundary, although remaining under army control.

Physical arrangement. If to be installed in existing shelter, approximately 120,000 square feet of floor space is required. If under canvas, a space approximately 540 by 300 yards is required. In either case, ground or floor space should be such as to permit expansion.

There is no conventional arrangement for a convalescent hospital. Hospital headquarters and the receiving department are placed conveniently for transport elements arriving with patients. The clinical section is installed adjacent to the receiving department with messing facilities for bed patients in the same general vicinity. For detention and convalescent sections containing only ambulant patients considerable leeway in location is allowable. The detention section is so placed as to facilitate the segregation of its patients from those of other sections.

The *establishing of the installation* is analogous to that of the evacuation hospital. The commander makes such decisions as to the location of sections and the extent of the initial establishment, while the exact location of departments and the priorities within the section are the prerogatives of the section commanders subject to the approval of the hospital commander. No portion of the hospital is ever established until the need for it is definitely foreseen. The condition of the patients arriving at the convalescent hospital is never such as demands extensive and elaborate hospital facilities requiring any considerable time for operation.

Operation. The *receiving department* is the responsibility of the clinical section and usually is operated by the medical service. The headquarters section furnishes clerical assistance and the property exchange is operated by the supply group of the same section. Clothing, valuables, and equipment are handled as in other army hospitals.

All patients brought to the receiving department are carefully examined by a medical officer, medical records checked or initiated, index cards initiated and sent to the registrar (adjutant), and assignment is made to ward or section or both. In the case of patients admitted to the convalescent section, only the section assignment is necessary, the section chief being charged with assignment to company, tent, etc., within the section.

At a specified time each day, or in emergencies at any time, the personnel of the receiving department examine cases referred to them by other sections of the hospital, either because of relapse or the presence of some intercurrent complication. Such cases are returned to their section with recommendations for treatment, or transferred to the clinical section for definitive treatment, or transferred to an evacuation hospital.

While at station, the *hospital headquarters* becomes the administrative center of the installation. It contains the office of the commander and his staff, the offices of the medical inspector, the registrar, unit personnel officer, commander of the detachment of patients, and the commander of the medical detachment. From it emanate all reports and returns relating to patients and duty personnel.

Headquarters maintains liaison with all medical units which are sources of patients, with the army surgeon and his assistants, and with army replacement units.

The commander and his staff correlate the functions of the various departments of the hospital, transfer personnel, both officer and enlisted, between sections to meet unusual situations as they arise, and conduct anticipatory planning relative to possible movements and expansion. Patients are direct admissions from the receiving department and transfers from the other sections.

Treatment is rendered. By the treatment of patients from the other sections in the

various clinics (eye, ear, nose, and throat, X-ray, dental, etc.) and by the operation of wards for the treatment of such cases as are indicated. With the exception of the genito-urinary clinic operated by the personnel of the detention section, it operates all the professional services of the hospital.

Short duration cases from units operating in the immediate vicinity of the hospital upon complete recovery are returned to duty. Other cases as indicated are transferred to the section within the hospital from whence they came, transferred to an evacuation hospital, or sent to designated replacement depot(s).

Type of patients are patients other than venereal who have not fully recovered from the effects of injury or disease and who will be able to perform full military duty upon complete recovery, but who no longer require any further treatment.

Operation. All patients admitted to the convalescent section are assigned to a company commanded by a medical officer. Such assignment may be made without regard to the condition from which the patient is recuperating, or in some situations various companies may be designated to receive certain types of cases such as an orthopedic company, a respiratory disease company, etc., depending upon the condition from which the patients are convalescing.

Each company commander is responsible for the medical records of the patients assigned to his company, for thoroughly familiarizing himself with each case, and with the rehabilitation of all cases under his control. At least once each day, he makes a thorough physical inspection of each man in his company and arranges for a graduated scale of exercises, assigns hours for bed rest, and by any other means at his command endeavors to bring about complete recovery in the shortest possible period of time.

If at his daily inspection he discovers signs or symptoms indicating relapse or the presence of a complicating or an intercurrent condition, he immediately refers such cases to the clinical section for consultation. Decision as to the disposition of such cases rests with the latter section (see above).

From the convalescent section, cases are either returned to duty (to replacement depot or to a command operating in the vicinity of the hospital) or transferred to another section of the hospital.

Detention section. The detention section renders care and treatment of venereal cases only.

Patients are received by direct admission or by transfer from the installations of other medical units within the army.

Treatment is definitive and supportive.

Normally, control of patients is facilitated by the organization of companies as in the convalescent section.

Patients recovering without permanent disability are returned to duty. Patients whose condition renders them unfit for further military service are transferred to an evacuation hospital for transfer to rearward installations.

Supply department. The supply group of the headquarters section procures and distributes supplies of all classes to the various sections and departments of the hospital.

Procedure in disposition of cases. All patients being returned to duty are reported to the receiving department, hospital headquarters and the registrar's office having been previously notified, where their clothing, equipment, and valuables, if any, are returned to them. They are turned over at the hospital to representatives of an army replacement depot, or in indicated cases are sent to their organization (units operating in the vicinity).

Cases requiring *transfer* for more elaborate treatment than can be rendered in the convalescent hospital and cases having conditions rendering their retention in the service undesirable are transferred to an evacuation hospital, usually by means of the ambulance elements of an army medical regiment. These arrangements are made by the receiving department through the hospital headquarters.

Procedure in case of *death* occurring within the installation is similar to that outlined for the evacuation hospital. The registrar, the ward surgeon, the laboratory officer, and the supply officer are charged with their appropriate pertinent functions.

Movement of hospital. When necessary, the installation is moved by echelon. A portion of the personnel and materiel is withdrawn from service and moved to a new location, by common carrier or army truck transport, to establish the new hospital. When the new hospital is ready to receive patients, the old one suspends admissions. The movement gradually proceeds from the old to the new location as the patient population decreases in the former and increases in the latter.

Administration. Personnel. All morning reports and other personnel reports and returns are submitted by the hospital headquarters to army headquarters.

Supply. Supply is handled as for the supply of the evacuation hospital.

Motor maintenance. First echelon, and such second echelon as is within their capabilities, is accomplished by the personnel of the transportation group of the headquarters section. Further repair and maintenance are accomplished by designated ordnance units in the army service area.

Care of sick and injured. When not at station, personnel of the medical service operates a dispensary for the care and treatment of the sick and injured of the unit personnel. The hospital being active, sick and injured personnel are reported to the receiving department for appropriate action.

Messes. The entire unit contains personnel and equipment for the operation of eleven messes, one for officers, one for enlisted duty personnel, the others for the patients of the various sections. The distribution of the latter will depend upon the number of patients within the various sections and may necessitate the transfer of mess personnel between sections. Usually, the supply officer operates the officers' and enlisted duty messes, officers of the section being designated as mess officers of the various patients' messes. The supply group draws the rations for all messes.

MEDICAL SUPPLY DEPOT, ARMY OR COMMUNICATIONS ZONE.

Organization. The medical supply depot is an organic element of the Army operating directly under the army commander or the army surgeon, as prescribed. Both the medical supply unit and the installation which it establishes are termed *depot*. To avoid confusion, the establishing agency is designated unit or medical supply unit, and its installation depot or medical supply depot.

Basically, the unit is organized to establish and operate one medical supply depot. However, it is capable when the situation demands of operating one *main* depot and one or two *advanced* depots. The organization of the two sections of the advanced depot platoon is identical. The optical repair section remains with the base platoon.

A suggested functional organization of the unit is shown in Plate 14.

Command. The medical supply depot is commanded by the senior officer of the Medical Corps assigned thereto and present for duty.

The unit commander is an officer having had prior training and experience in the various phases of medical supply functions. He is directly responsible to the army commander or the army surgeon, as may be prescribed, for the administration, discipline, training, and operation of the unit in all situations.

Depot Headquarters Section. The depot headquarters section includes the unit commander and the enlisted assistants required in the headquarters section.

When the unit is not at station the headquarters is located at a convenient point in the unit camp area. When the unit is operating but one depot, the headquarters is located adjacent to the depot. If the unit is operating more than one depot, the headquarters remains with the base depot.

Staff. Executive officer. The executive is an officer of the Medical Corps with considerable experience and training in the procurement and handling of medical supplies.

Adjutant. The adjutant is an officer of the Medical Administrative Corps, Sanitary Corps or Specialist Reserve. In addition to handling the routine duties of his office he may be designated unit personnel officer.

Unit supply officer. The unit supply officer, an officer of the Medical Administrative Corps, is usually charged with the operation of the unit mess and may be designated

1	2	3	4	5	6	7	8	9	10	11
Unit	Technician grade	Depot headquarters and transportation section	Base depot section	Optical repair section	Base depot section	Section 1	Section 2	Total	Enlisted cadre	Remarks
Private—Continued.										
47 Cook's helper (321) (345)		(3)				(2)	(2)	(2)		
48 Driver, light truck (345)		(3)			(2)	(2)	(2)	(4)		
49 Engineer, powerhouse (077)										
50 Machine, general (114) (014)										
51 Mechanic, automobile (014)										
52 Mechanic, automobile (014)										
53 Operator, telephone (309)										
54 Operator, telephone (309)										
55 Optical repairman (089)										
56 Optical repairman (089)										
57 Orderly (089)										
58 Shipping packer (308)										
59 Typist (247)										
60 Tylist (247)										
61 Tylist (247)										
62 Basic (021)										
63 Total enlisted	21	14	7	101	42	42	27	19		
64 Aggregate	22	15	8	108	45	45	28	19		
65 Trailer, 1-ton, 2-wheel, cargo										
66 Trailer, 1-ton, 2-wheel, water tank (1-ton)										
67 Truck, 1-ton, carry-all										
68 Truck, 1-ton, carry-all										
69 Truck, 3½-ton, including										
70 More										
71 Optical repair unit										
72 Optical repair unit										

Plate 14. T/O 8-661.

Medical Supply Depot, Army or Communications Zone.

1	2	3	4	5	6	7	8	9	10	11
Unit	Technician grade	Depot headquarters and transportation section	Base depot section	Optical repair section	Section 1	Section 2	Total	Enlisted cadre	Remarks	
Lieutenant colonel										
2 Major										
3 First lieutenant										
4 Total commissioned										
5 Master sergeant, including										
6 Clerk, chief (020)										
7 First sergeant (183)										
8 Clerk, chief (020)										
9 Clerk, shipping (183)										
10 Quartermaster (222)										
11 Staff sergeant (085)										
12 Assistant quartermaster (222)										
13 Clerk, record (085)										
14 Mess (084)										
15 Supply (020)										
16 Technician, optical, and section										
17 Sergeant, including										
18 Clerk, stock (321)										
19 Instrument repairer (089)										
20 Section leader (032)										
21 Technician, X-ray (244)										
22 Corporal, including										
23 Clerk, company (085)										
24 Clerk, general (085)										
25 Despatcher (410) 3										
26 Technician, grade 4										
27 Private, first class										
28 Bugler (089)										
29 Carpenter, construction (089)										
30 Clerk, general (085)										
31 Clerk, record (085)										
32 Clerk, stock (034)										
33 Clerk, stock (034)										
34 Clerk, stock (034)										
35 Clerk, stock (034)										
36 Cook (089)										
37 Cook (089)										
38 Cook (089)										
39 Cook (089)										
40 Cook (089)										
41 Cook (089)										
42 Cook (089)										
43 Cook (089)										
44 Cook (089)										
45 Cook (089)										
46 Cook (089)										

*This table supersedes T/O 8-235, November 1, 1940, including C1, June 6, 1941.

detachment commander. In the discharge of any or all of these functions, enlisted assistance is furnished by the headquarters section.

Dental and veterinary assistants. Two officers, one each from the Dental Corps and Veterinary Corps, act as assistants to the unit commander on matters pertaining especially to their respective corps. Their services are especially valuable when necessity demands the local procurement by purchase of dental and veterinary supplies. Although they are staff assistants, most of their actual duties are performed in the administrative section of the depot.

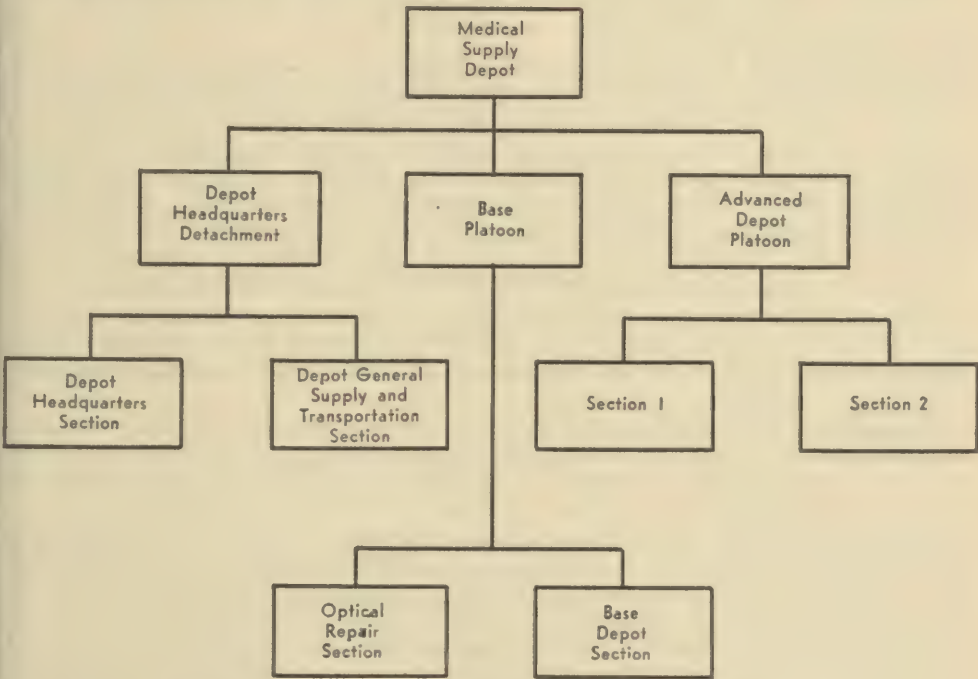


Plate 15. Functional Organization of Medical Supply Depot.

The **Base Platoon** is commanded by an officer of the Medical Corps highly specialized in all phases of medical supply functions. After the platoon has established the depot, the platoon commander supervises all phases of its operation, exercising such command as the unit commander, who also is the depot commander, may delegate to him. He is in effect the executive officer of the depot. In addition, he is the accountable officer for the depot and maintains the depot stock record account.

The *optical repair section* includes one officer (optical specialist), one staff sergeant (technician, optical and section leader), and six technicians or privates. This section as implied by its designation, makes such repairs and adjustments of all optical items of medical supply as can reasonably be performed in the field with the available equipment. One 2½-ton truck, cargo and one 1-ton cargo trailer furnish the transportation for the special equipment of the section.

Enlisted Personnel. *General qualifications.* During active operations, the personnel of the medical supply unit will be subjected to long and arduous labor, the demands for supplies will be continuous, and any movement of the installation due to enemy air observation will be made under cover of darkness. For these reasons, the general qualifications of the enlisted personnel are the same as for other medical units in the combat zone.

Vocational qualifications. The unit is one of specialists. Almost every enlisted man must possess, from training and experience received prior to or after entry into the

service, a considerable knowledge of some particular specialty. Those specialists utilized in the routine administration of the unit are trained after entry into the service. However, such specialists as instrument and optical repairers are selected from individuals having actual knowledge of these occupations by reason of previous employment in civil concerns manufacturing and repairing surgical instruments and optical supplies. Every individual officer and enlisted man, in the optical repair section falls into the latter category.

Individual. Although the chief duties of the enlisted personnel of the unit pertain to administration and supply, nevertheless each man is trained in the basic qualifications of the Medical Department soldier.

Specialist training includes training of carpenters, clerks, instrument repairers, machinists, storekeepers, assistant storekeepers, stenographers, electric plant operators, mechanists, optical specialists, and record, stock and stock shipping clerks.

Group. As soon as the individual and specialist training has progressed sufficiently, training in functional groups is instituted. This is applicable to the operation of unit headquarters, the mess, the depot office, the depot storeroom, the optical repair section, and the transportation personnel. Some group training is gained within the zone of the interior or the communications zone by actual apprenticeship in operating medical depots. This type of training is highly desirable whenever it can be arranged.

Unit. After completion of group training, unit training is accomplished by actual participation by the entire unit in large scale field maneuvers. Due to lack of sufficient integral transportation to accomplish movement of the unit, other means of unit training are not available.

Installations. The installations of the unit are medical supply depots. The term medical supply depot may be further qualified as a base or an advanced depot. Ordinarily, the unit establishes and operates but one base depot but may operate in addition one or two advanced depots.

Physical arrangement. In the ideal situation, the depot is established in permanent or semipermanent buildings. Canvas (tents or paulins) is utilized only when necessary. Conventionally, the depot requires two buildings (existing or constructed), one of the large warehouse type and one smaller, preferably adjacent to the former.

A suggested arrangement of the depot within the larger building is, in one end, to establish the depot office (depot headquarters section); adjacent to the office and occupying the bulk of the central portion of the building, to store the supplies; the remainder of the building to be occupied by the general and optical repair sections. This building should have, on one side, a railroad siding, a dock, or a suitable approach for motor vehicles; on the other, a motor road.

The second building houses the mess, the unit supply, and the transportation office. At the discretion of the unit commander, the headquarters may be established in this building or combined with the depot office. The former location is deemed preferable as it tends to delineate between purely unit and depot administration.

Storage and issue. Efficiency in the handling of the medical supplies is increased by dividing the storage and issue section into two functional groups:

Receiving and storage. Operates in that portion of the depot adjacent to the incoming carrier, rail, boat, or motor vehicle, receives all supplies consigned to the depot, checks all items against the packers' lists, and stores such supplies in a manner designed to facilitate their later issue.

Issue. Located on the opposite side of the building, receives requisitions, memoranda, or other authorized requests for supplies; removes from storage, packs, and segregates the orders; and loads supplies on the transport sent to the depot by the consuming units. This group, or the depot office from information submitted by this group, prepares invoices for the outgoing supplies, shipping tickets, or obtains informal receipts from the receiving agency.

Repair department. If considered desirable, the repair department may be divided into a general, an instrument, and an optical repair group, each functioning as implied by the designation.

Establishing depot. As soon as possible after the general location of the depot has been designated, the unit commander accompanied by his staff, the commander of the base platoon, and certain key enlisted personnel proceed to the site and survey the accommodations. Decision is made as to the utilization of existing shelter and arrangements made with army engineers for repairs, alterations, or any necessary new construction, including enlargement or installation of railway siding facilities. Usually, the integral motor transport of the unit with trucks carrying portions of the organizational equipment moves forward with the commander.

When the bulk of the depot supplies and unit equipment arrives by rail or truck transport, the unit commander informs appropriate officer and enlisted personnel of the location of the various departments. Each functional group (section or platoon) then proceeds with the unloading of its particular equipment and the establishment of its department with the least possible delay. All possible aid is furnished the storage and issue section in the unloading of the depot supplies.

Operation. Additional depot supplies are procured from the next higher medical supply echelon, usually in the communications zone, by one of the following methods:

Automatically, wherein a flow of supplies to the army depot based on the average expenditures is initiated by the depots of the higher echelon in an effort to keep the stock of the army depot at a prescribed level (usually 10 days).

By formal requisition which must be approved by the higher echelon.

In emergencies, by formal request which also must receive the approval of the higher echelon.

By drawing against credits established in its depots by the higher echelons. Requisitions against credits require no individual approval. When exhausted, credits must either be renewed or other means of supply substituted. The credit system is invoked by higher echelons when there is a shortage in some particular item or items within the theatre and assures an equitable distribution of the supply on hand.

Army medical depots, according to the policy established by the chief surgeon, endeavor to maintain a *stock* calculated to supply the army units for a definite period of time. Based on the type of operations, and the many factors influencing the flow of supplies from the zone of the interior to the theatre and from the communications to the combat zone, such period may vary from 3 to 10 days. In addition, complete sets of equipment for attached medical units are stocked. Usually the army depot does not stock complete sets of organizational equipment for larger medical units.

Usually, regardless of whether the unit is operating one or three installations, but *one stock record account is maintained* (for exception see below). In situations other than combat, accomplished shipping tickets become vouchers for dropping from accountability all items issued. Under combat conditions, such records as hand receipts may become sufficient authority for relief from accountability.

Issue of medical supplies by the depot is accomplished by one of the following methods:

At the depot, either directly to subordinate supply officers who bring their own transport, or by shipment by common carrier to the railheads of divisions and corps.

By arranging with the higher supply echelon and the regulating officer for a carload shipment destined for one establishment, such as an evacuation hospital, to be sent direct to a railhead adjacent to such establishment. On depot records, such shipments are handled as though they had actually passed through the depot.

In emergencies, by delivering supplies on unit transport directly to the consuming installation.

The *repair department* of the depot within limits of ability of personnel and available equipment makes repairs to all items of medical supply damaged during shipment to the depot or after issue by the depot. Items belonging to the former category, as soon as the damage is discovered by the storage and issue section, are transferred informally to the appropriate repair section. Items damaged after issue are returned to the depot, usually on the transport of subordinate medical supply officers, and transferred to the repair department. All items received by the repair department are disposed of in one of the following ways:

Repaired and returned to the storage and issue department.

Repaired and returned to the supply officer requesting such repair.

Reported to the depot office as nonsalvageable and held for survey (if such formality be necessary).

Returned to higher supply echelon for disposition.

Movement of depot. Any displacement of the depot forward or backward in its entirety disrupts its functional capacity. Therefore, movement is accomplished as follows:

A portion of the unit (see below) transported by common carrier or trucks proceeds to the new location, carrying with it a varying amount of the more critical items of supply. Upon arrival, it lays out the new depot in skeletal fashion and initiates a limited operation.

The base depot section of the unit continues the operation of the old depot until a designated time and date, when it packs the remaining organization equipment and supply stock and moves to the new location.

In the meantime, through arrangements with the higher supply echelon and the regulating station, all incoming shipments are routed directly to the new depot. Thus a continuous operation is permitted and the logistical problem is minimized.

Advanced depot platoon. Under certain situations (see FM 8-15) a medical supply unit may operate one or two advanced depots in addition to the base depot.

In general, *functional groups* within an advanced depot are limited to a records, a storage and issue, and a mess group. No sharp delineation is possible as all personnel perform such duties as the situation demands.

There is no conventional *arrangement* of an advanced depot. Existing shelter at the designated site is utilized to the best advantage. Canvas is utilized when necessary and available.

Ordinarily, supplies are procured informally from the main depot. Under exceptional circumstances, as when the depot is serving an independent corps, procurement may be from a designated communications zone depot (see above).

The minimum amount of supplies compatible with the situation is stocked.

Administration. The unit has internal administrative responsibilities comparable to those of a company. These devolve upon headquarters and the headquarters section.

In addition, the unit is charged with the internal administration of the depot(s).

MEDICAL LABORATORY, ARMY OR COMMUNICATIONS ZONE

Organization. (See Plate 16 and T/O 8-611). The medical laboratory, a mobile unit is an organic element of the army operating under such technical supervision of the army surgeon or his representative, the army medical inspector, as is prescribed by the army commander.

Functionally, the unit divides itself into a headquarters, a headquarters section, and four laboratory sections, one stationary and three mobile. The stationary section acts as the base laboratory and the mobile sections as satellites assisting the base laboratory in the study of epidemiological, sanitary, and other problems.

Functions. In general, the medical laboratory is designed to provide the army medical service with facilities that are immediately available for certain types of laboratory supplies; supplemental laboratory examinations, and epidemiological and sanitary investigations.

The laboratory has specific functions as follows:

Performs routine water analyses.

Performs special examinations pertaining to meat, food, and dairy supplies.

Investigates epidemics and epizootics.

Distributes special laboratory supplies such as special reagents and solutions, culture media, and diagnostic biologicals not furnished through routine supply channels.

Performs for army medical units special serological, bacteriological, pathological, and chemical examinations when the emergency demands less delay than would be entailed by referring them to the general medical laboratory.

Augments temporarily in emergencies the laboratory section of any army unit, or assists in the organization of a combined laboratory section functioning for several units grouped in the same locality. In performing such temporary augmentation, withdrawal is accomplished at the earliest possible time.

Performs post-mortem examinations incident to special investigations, and collects and preserves such pathological specimens as are of historical or educational value to the Medical Department.

Command. The unit, medical laboratory, is commanded by the senior officer of the Medical Corps assigned thereto and present for duty.

The commander is an officer who has had broad training in general laboratory work and epidemiology. He is directly responsible to the army commander or the army surgeon, as may be prescribed, for the administration, discipline, training, and operations of the unit in all situations.

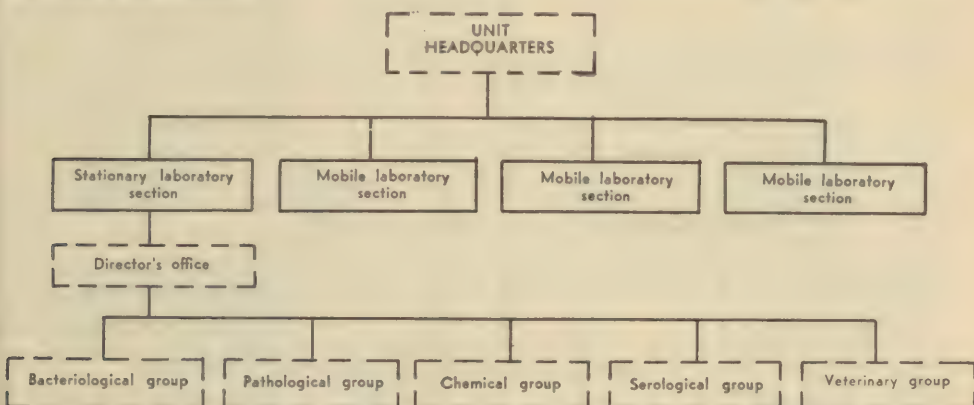


Plate 16. Fundamental Organization of the Medical Laboratory.

Headquarters. The headquarters consists of the unit commander, his staff, and certain enlisted personnel to assist in the internal administration of the unit. The latter include a technical sergeant, a mess and supply sergeant, and such specialists as a clerk, cooks, motorcyclists, chauffeurs, and a typist.

The headquarters is located invariably with the basic element of the unit, the stationary laboratory.

The headquarters administers and supplies the unit, operates the unit transport other than the transportation which moves the mobile laboratories, messes the entire unit except when elements are widely separated, and occasionally furnishes clerical and transportation aid to the laboratory elements.

Staff. The unit staff consists of one officer, usually an officer of the Medical Administrative Corps, who is the adjutant and as such is charged with the usual duties of that office. In addition, he may be designated to perform other staff functions, including those of the unit supply officer.

If the commander desires additional staff officers, he may so designate them from the other officers of the unit. However, the detailing of officers for administrative duties must be carefully considered in the light of the technical functions of the unit and its installations.

Enlisted Personnel. General qualifications. (Same as for evacuation hospital.)

Vocational qualifications. The majority of the enlisted men of this unit are laboratory technicians. Individuals with previous experience as medical students or technicians in civil clinical laboratories prior to entry into the service may be utilized to advantage.

Training. In addition to basic individual training, specialists shown in Tables of Organization must be trained. Those requiring qualification for this particular unit are:

Technicians, laboratory, noncommissioned. One master, four technical, two staff, and six sergeants trained as laboratory technicians. In addition to training in basic laboratory methods and technique, one noncommissioned officer is trained in each of the following laboratory specialties: chemistry and toxicology, bacteriology, pathology, serology, and veterinary laboratory procedures. The highly specialized technical training of these

	1	2	3	4	5
1	Unit	Technician grade	Medical laboratory ^a	Enlisted cadre	Remarks
2	Lieutenant colonel.....		^b 1		
3	Major.....		(^c 1) ^d 3		
4	Captain.....		(^e 2) ^f 5		
5	First lieutenant.....		^g 1		
6	Second lieutenant.....		^h 1		
7	Total commissioned.....		11		
8	Master sergeant, including.....		1	1	
9	Technician, laboratory (411).....		(1)	(1)	
10	Technical sergeant, including.....		4	4	
11	Technician, laboratory (411).....		(4)	(4)	
12	Staff sergeant, including.....		3	1	
13	Chief clerk (052).....		(1)	(1)	
14	Technician, laboratory (411).....		(1) 2		
15	Sergeant, including.....		8	1	
16	Mess and supply (824).....		(1)	(1)	
17	Motor (337).....		(1)		
18	Technician, laboratory (411).....		(1) 5		
19	Technician, laboratory (411).....		(^k 1)		
20	Corporal, including.....		1		
21	Motor (337).....		(1)		
22	Technician, grade 3.....		2		
23	Technician, grade 4.....		6	1	
24	Technician, grade 5 including.....		10	2	
25	Private, first class.....		7		
26	Private.....		10	1	
27	Chauffeur (344).....		(1)		
28	Clerk, general (055).....	5	(1)	(1)	
29	Clerk, typist (405).....		(1)	(1)	
30	Cook (080).....	4	(1)	(1)	
31	Cook (080).....	5	(2)	(1)	
32	Cook's helper (521).....		(1)		
33	Driver, heavy truck (245).....	5	(1)		
34	Driver, light truck (345).....	5	(1)		
35	Driver, light truck (345).....		(3)		
36	Mechanic, automobile (014).....	5	(3)		
37	Orderly (695).....		(3)		
38	Stenographer (213).....	4	(1)		
39	Technician, laboratory (411).....	3	((^k 1) 2)		
40	Technician, laboratory (411).....	4	(3)		
41	Technician, laboratory (411).....	5	(4)		
42	Technician, laboratory (411).....		(^k 4)		
43	Basic (521).....		(4)		
44	Total enlisted.....		51	11	
45	Aggregate.....		62	11	
46	Q Semitrailer, 2-wheel, laboratory.....		1		
47	Q Truck, 1/4-ton.....		2		
48	Q Truck, 3/4-ton, carry-all.....		1		
49	Q Truck, 2 1/2-ton, cargo.....		3		
50	Q Truck, 4- to 5-ton, tractor.....		1		

^a Includes 1 stationary laboratory and 3 mobile laboratories. Each mobile laboratory consists of—

Personnel—

1 captain, Medical Corps.
1 technical sergeant.
2 laboratory technicians.
1 chauffeur.

Equipment—

1 2 1/2-ton truck outfitted with laboratory chests as required from base unit.

1 1/4-ton truck assigned from base unit when required.

^b Commanding officer, Medical Corps, with broad training in general laboratory work and epidemiology.

^c Veterinary.

^d Includes—

1 bacteriologist, Medical Corps.

1 pathologist, Medical Corps.

1 bacteriologist and pathologist,

Veterinary Corps, with special training in the laboratory examination of foods.

^e May be Sanitary Corps.

^f Includes—

3 captains, Medical Corps, in charge of the 3 mobile laboratories.

1 chemist, Sanitary Corps or Medical Corps, with special training in biochemistry, water chemistry, and toxicology.

1 serologist, Sanitary Corps or Medical Corps.

^g With special training in general laboratory work and medical biology.

^h May be Medical Administrative Corps.

ⁱ 1 with special training in toxicology, 1 with special training in bacteriology.

^j 1 with special training in pathology. 1 with special training in serology.

^k With special training in veterinary laboratory procedures.

The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.

Plate 17. T/O 8-611. Organization of the Medical Laboratory, Army or Communications Zone.

individuals is accomplished by attachment for temporary duty to the laboratory service of an army hospital authorized for such training in the zone of the interior or by attendance at appropriate resident courses offered by the Army medical and veterinary schools.

Privates, first class, and privates. Certain privates first class, or privates trained as

general laboratory technicians and one as a veterinary laboratory technician. The basic laboratory training of these individuals includes a knowledge of the more common laboratory apparatus; the principles and practice of asepsis and sterilization; the obtaining of specimens such as nasal, throat, blood, urethral smears, and water samples; methods of collecting mosquitoes and other entomological specimens; the preparation and inoculation of culture media; and the technique of the more common staining methods. Following the basic technical training, various individuals are given special training to provide in effect assistants for the noncommissioned specialists.

One man is trained in the general duties of a *stenographer*, and in laboratory terminology, laboratory abbreviations, and the preparation of laboratory reports.

One man from the headquarters section is trained as a *typist*. He must be proficient in grammar, spelling, and punctuation, and after training should be capable of operating any standard typewriter and transcribing at the rate of not less than 40 words per minute after having deducted for all errors.

Group. Group training is applicable to the chauffeurs, cooks, motorcyclists, and laboratory technicians.

Unit. Since the unit is composed of a stationary or base section and three satellite mobile sections, all of which will function as a team in the field, much of the unit training will be of a technical nature.

Technical training includes the establishment and operation of the laboratories, stationary and mobile, in improvised or existing shelter and under varying conditions of weather and terrain. Utilizing available facilities (terrain and personnel), epidemiological surveys requiring the participation of the entire unit may be executed.

The **unit tactical training** is limited to anti-aircraft protection, selection of sites for installations, concealment, camouflage, and a general knowledge of the tactics of other army medical units is essential.

Logistical training includes the packing and unpacking of equipment, movement by motor (day and night), and supply while operating in the field.

Installations. The unit is capable of establishing and operating one stationary and three mobile laboratories, the former being the basic and the latter auxiliary elements.

The unit, as a whole, moves by common carrier or by its integral transport augmented by additional trucks to the site previously designated for the location of the basic element.

Stationary laboratory. The stationary laboratory, together with the unit headquarters, is located well to the rear in the army area where it will not become involved in minor movements and where it is readily available. It is established in existing buildings, preferably in a civil laboratory, such as may be available in a school, a public health agency, or a commercial organization.

The internal functional organization must remain flexible as the demands upon the various laboratory specialties will fluctuate with the territorial location, the season, the character of the troops and the civil population, and various other factors. However, to promote the general efficiency of the establishment, the following organization based upon the qualifications of the personnel is suggested.

Headquarters section includes personnel of the unit commander; an assistant, an officer of the Medical or Sanitary Corps; the master sergeant (sergeant major); 1 technical sergeant; 1 sergeant; and 2 privates, first class, or privates; 1 stenographer, 1 laboratory technician and 2 basic. This group correlates the operations of the laboratory, assigns personnel to functional groups therein, receives and distributes incoming specimens, checks and dispatches outgoing reports, handles the laboratory supplies, records all statistical data concerning the work performed by the installation, and in emergencies furnishes technical aid to the various groups as indicated.

Bacteriological group includes personnel specially trained in bacteriology; 1 officer, Medical Corps; 1 staff sergeant; 1 sergeant; and 3 privates, first class, or privates.

Pathological group includes personnel specially trained in biochemistry, water chemistry, and toxicology; 1 officer, Medical or Sanitary Corps; 1 staff sergeant; 1 sergeant; and 1 private, first class, or private.

Serological group includes personnel specially trained in serology; 1 officer, Medical or Sanitary Corps; 1 sergeant; and 1 private, first class, or private.

Veterinary group includes personnel specially trained in veterinary bacteriology and pathology, the laboratory examination of foods, and other general veterinary laboratory procedures; 1 officer, Veterinary Corps; 1 sergeant; and 2 privates, first class, or privates.

Physical arrangement. The arrangement of the various groups within the laboratory will depend upon the plumbing and lighting facilities within the buildings utilized.

Operations. Within the purview of policies laid down by the army surgeon, material submitted to the stationary laboratory will come from:

Laboratory sections of army medical units.

Army medical inspector or his assistants.

One of the mobile laboratories operating apart from the stationary laboratory.

Other sources designated by the army surgeon.

All requests for laboratory procedures are routed to the headquarters section where they are disposed of as follows:

Classified and delivered to the appropriate functional group, or

Forwarded to the office of the army surgeon for transmittal to appropriate laboratories in the communications zone.

Copies of reports of the examinations completed are disposed of as follows:

One copy filed in the office of the headquarters section.

One copy to the unit submitting the request routinely through the message center, or in emergencies by courier or other means.

The mobile laboratory unit contains three mobile laboratories, each capable of limited temporary independent technical operations. As implied by the designation, the mobile laboratory moves by means of light motor transportation and operates to solve a specific problem. It is not contemplated that the mobile units of army laboratories will ordinarily do complicated definitive laboratory work. They will carry out simple laboratory procedures and will collect material for epidemiological, sanitary, or supplemental laboratory examinations. More complicated examinations such as certain types of bacteriological work and chemical analyses requiring equipment and facilities that are not easily transportable will ordinarily be performed in the stationary section of the army laboratory. The necessary equipment and supplies required to meet any specific situation will be furnished by the stationary section. Such equipment and supplies should be so organized that they can be rapidly assembled in standard Medical Department chests, placed in a carry-all or other light transportation, and transported where needed with the least possible delay, considering road priorities. Routinely, the mobile laboratories remain under the control of and are administered by the basic unit. However, when operating at a considerable distance from the basic element, they may be attached for rations only to other units.

Upon receiving a directive from the unit commander, the officer in charge studies the mission, makes an estimate of the situation, selects and packs the required supplies, arranges for personnel as indicated, and moves out to the location specified. Upon arrival, he selects a suitable site for the installation and proceeds with the project. The laboratory may change its location whenever necessary, due notice of such moves being sent at once to the unit commander. Upon completion of the project, or earlier if so ordered, the laboratory returns to the headquarters of the unit without delay.

During intervals between independent missions, the mobile laboratory personnel will be utilized in the stationary section at the discretion of the unit commander.

The *personnel of each mobile laboratory* include an officer of the Medical Corps, one technical sergeant, and three privates, first class, or privates. Of the latter, two should be laboratory technicians and one chauffeur. If required for the mission, this group may be augmented by additional specialists from the stationary laboratory.

Administration. The unit has internal administrative responsibilities comparable to those of a company. These devolve upon the unit commander and his headquarters.

In addition, the unit is charged with the internal administration of the laboratory installations which it establishes. These also evolve upon the unit commander.

If elements of the unit operate separately, all administrative overhead remains at the unit headquarters (vicinity of the stationary laboratory).

Concerning supplies in general, the stationary laboratory section should be equipped for independent operation and in addition maintain sufficient supplies and equipment to operate the mobile sections. A complete list of the initial supplies and equipment is contained in the basic equipment lists, laboratory, army and communications zone. Additional supplies are obtained by requisition through command channels from proper army depots. Special laboratory supplies not handled by the army medical supply depot are obtained from designated laboratories in the communications zone. According to existing policy, formal requisition may or may not be necessary in obtaining such special items.

VETERINARY COMPANY, SEPARATE

The organization of the company is designed to facilitate functional division. The five platoons are identical and each is capable of independent tactical and technical operation, although dependent upon the company headquarters for administration. Likewise, each platoon contains three sections which again are capable of limited independent operation.

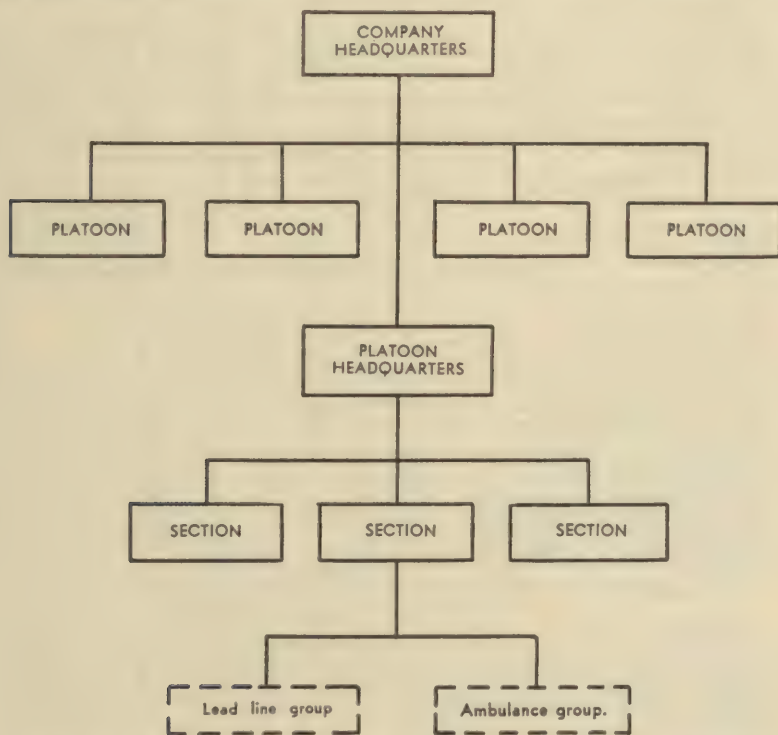


Plate 18. Functional Organization of Veterinary Company, Separate.

The veterinary company, separate, is either:

An autonomous element of army troops under such control of the army surgeon or his representative, the army veterinarian, as the army commander prescribes.

A GHQ unit operating under such direct control of the chief surgeon, GHQ as prescribed by its commander.

Functions. The chief functions of the separate veterinary company are the evacuation of noneffective sick and injured animals by means of lead lines and motor transport, and their care and treatment during the movement. It evacuates cases within the combat zone as follows:

In the absence of second echelon veterinary service within the division (veterinary troop), it evacuates cases from the installations of the first echelon veterinary service (stations of veterinary sections of medical detachments) directly to the veterinary evacuation hospital.

1	2	3	4	5	6	7
Unit	Technician grade	Company head-quarters	5 platoons (each) ^a	Total company	Enlisted cadre	Remarks
2 Captain.....		1		1		
3 First lieutenant.....		1	b 1	6		
4 Total commissioned.....		2	1	7		^a Each platoon may be divided into 3 sections.
5 First sergeant (585).....		1		1	1	^b Mounted on horse.
6 Staff sergeant, including.....		4	1	9	3	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
7 Mess (824).....		(1)	(1)	(1)	(1)	
8 Motor (813).....		(1)	(1)	(1)		
9 Platoon (651).....		(b 1)	(1)	(1)	(1)	
10 Stable (710).....		(1)	(1)	(1)	(1)	
11 Supply (821).....			3	15	1	
12 Sergeant, including.....			(b 3)	(15)	(1)	
13 Section leader (652).....			1	3	16	
14 Corporal, including.....			(3)	(15)		
15 Assistant section leader (652).....			(1)		(1)	
16 Clerk, company (405).....						
17 Technician, grade 4.....				13	4	
18 Technician, grade 5.....				23	2	
19 Private, first class.....		19	25	46		
20 Private.....				62	1	
21 Bugler, messenger (803).....		(1)	(1)	(1)		
22 Carpenter, construction (050).....	5	(1)	(1)	(1)		
23 Clerk (055).....		(1)	(1)	(1)		
24 Cook (060).....	4	(2)	(2)	(2)	(1)	
25 Cook (060).....	5	(2)	(2)	(2)		
26 Cook's helper (521).....		(3)	(3)	(3)		
27 Driver, heavy truck (245).....	5		(3)	(7)		
28 Driver, heavy truck (245).....				(8)		
29 Driver, light truck (345).....	5	(2)	(2)	(11)		
30 Driver, light truck (345).....		(1)	(2)	(11)		
31 Horseholder (521).....		(b 1)		(5)	(1)	
32 Horseshoer, clinical (094).....	4		(b 1)	(5)	(1)	
33 Mechanic, automobile (014).....	4	(1)	(1)	(1)	(1)	
34 Mechanical, automobile (014).....	5	(1)	(1)	(1)		
35 Orderly (695).....		(1)		(1)		
36 Orderly, ambulance, veterinary (697).....			(9)	(45)		
37 Stableman (311).....			(1)	(5)		
38 Technician, medical, veterinary (250).....	5		(1)	(5)	(1)	
39 Technician, medical, veterinary (250).....			(b 3)	(15)	(1)	
40 Technician, surgical, veterinary (226).....	4		(1)	(5)	(1)	
41 Technician, surgical, veterinary (226).....	5		(1)	(5)	(1)	
42 Basic (521).....		(2)	(3)	(17)		
43 Total enlisted.....		25	32	185	13	
44 Aggregate.....		27	33	192	13	
45 Q Animal, including.....		3	14	73		
46 Horse, draft.....			(6)	(30)		
47 Horse, riding.....		(3)	(8)	(43)		
48 Q Semitrailer, 6-ton, combination animal and cargo carrier.....			3	15		
49 Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....		1		1		
50 Q Truck, 1/4-ton.....		1	1	6		
51 Q Truck, 3/4-ton, command and reconnaissance.....		1		1		
52 Q Truck, 1 1/2-ton, cargo.....			1	5		
53 Q Truck, 2 1/2-ton, cargo.....		1		1		
54 Q Truck, 4- to 5-ton, tractor.....			3	15		

Plate 19. T/O 8-99, April 1, 1942. Organization of Veterinary Company, Separate.

Within the cavalry division, the veterinary troop furnishing second echelon veterinary service; it evacuates cases from the installations of that echelon (veterinary clearing stations and clearing posts) to the veterinary evacuation hospitals.

Within the army service area, it furnishes evacuation or transfer service as follows:

From the veterinary evacuation hospital to the veterinary general or veterinary convalescent hospital, or to the railhead for further evacuation to the rear.

From the veterinary convalescent hospital to the veterinary evacuation hospital or veterinary general hospital (relapsed cases).

Transfers discharged patients from veterinary hospitals to remount units.

Command. The company is commanded by the senior officer of the Veterinary Corps assigned thereto and present for duty. He is directly responsible to the army commander or the surgeon, as may be designated, for the administration, discipline, training, and operations of the company in all situations.

Although the army surgeon cannot delegate his command responsibilities pertaining to the veterinary company, separate, he routinely delegates the supervision of the tactical and technical operations of the company to the army veterinarian, the latter keeping the surgeon fully informed at all times concerning such operations.

Company Headquarters. The company headquarters under Tables of Organization consists of the company commander, a commissioned assistant of the Veterinary Corps, and the necessary enlisted assistants required in the internal administration of the unit. The latter include the first sergeant; the supply, mess, motor and stable sergeants; the company clerk; and such specialists as bugler, chauffeurs, clerks, cooks, carpenter, and automobile mechanics. The stable sergeant and one orderly (private) are mounted.

The personnel of company headquarters established operate an installation designated also company headquarters. As established, the company headquarters consists of the company CP (office of the company commander and the message center), the unit mess, the unit supply distributing point, motor maintenance department, the company stables (picket lines), and any other departments necessary for the internal company house-keeping. The company commander may delegate to his commissioned assistant such functions as the operation of the mess, the unit supply, and the care and maintenance of the unit transport.

The company headquarters does not lend itself to division, and functional elements of the company operating separately ordinarily are not augmented for administrative purposes by headquarters personnel.

Such reports and returns concerning sick and injured animals as may be required by higher authority are initiated by functional elements (platoons) and consolidated and forwarded by the company headquarters.

Platoon. Each of the five platoons consists of a platoon headquarters and three sections. The platoon is designed to serve a type corps or a cavalry division; the section, an infantry division. It is an organic element of the separate veterinary company capable of independent tactical and technical operation but dependent upon company headquarters for administration.

The platoon is commanded by an officer of the Veterinary Corps, usually a lieutenant, who is directly responsible to the company commander for the operation of the platoon in all situations.

The platoon performs the technical functions of the company incident to the evacuation of sick and injured animals and their care and treatment during movement. In the performance of these functions the platoon operates three lead lines and three veterinary ambulances.

Platoon Headquarters. The platoon headquarters consists of the platoon commander, the platoon sergeant, a chauffeur, a clinical horseshoer, and a stable man. The platoon commander and the horseshoer are mounted but during operations the mount of one of these individuals may be required for one of the lead lines. Inasmuch as motor transport (truck) is available, this transfer results in no impairment to the mobility of either individual.

The platoon headquarters establishes the *platoon CP* which consists of the office of the platoon commander and the message center. The latter is omitted if the message center of the company is in the same vicinity. Ordinarily the CP is located comparatively near the veterinary evacuation hospital to which or from which the platoon is evacuating animal casualties. In the usual situation it will be forward of this installation and on the route traversed by the evacuating elements.

The platoon headquarters personnel are charged with: Check of the emergency veterinary tag of each animal evacuated by the platoon, and the entry in the appropriate space of the disposition made of the case. Maintenance of a log of evacuated animals containing the following data for each case: the animal's Preston brand number; organization, if known; general nature of sickness or injury; method by which evacuated; lead line or ambulance number; and the hour, date, place, and manner of disposition. Data from this log are extracted from time to time and forwarded to company headquarters for consolidation and rendition to higher authority.

Control of Operation. Through the personnel of platoon headquarters and the CP which they establish, the platoon commander is able to control the operation of the various sections and elements thereof. Each ambulance and lead line is numbered and as it passes and repasses the CP a record is kept of the time, route, and destination, thus enabling the platoon commander to know at all times the approximate location of each element of the platoon.

Liaison: While primarily a section function, from time to time various individuals from platoon headquarters assist in maintaining liaison with the forward veterinary installations being evacuated by the platoon. The chauffeurs may be trained and utilized in this capacity as the need arises.

The section having no prescribed allotment of personnel, the following is suggested: one sergeant (section leader), one corporal (assistant), a chauffeur, three ambulance orderlies, two technicians (veterinary or veterinary surgical), and one basic private or private, first class. Four of these individuals being mounted (see above), the section falls naturally into two groups, a lead line group, the sergeant, two technicians, and the basic private; and an ambulance group, the corporal, the chauffeur, and the ambulance orderlies.

Each section operates one lead line and one veterinary ambulance. For effective operation, contact with the forward veterinary elements must be established early and maintained continuously. For this mission the section leader and the assistant section leader are especially trained in the tactics and operative procedures of the units furnishing first and second echelon veterinary service, map reading, sketching, orientation by day or night, and the use of available means of communication. For the initiation of contact these individuals may precede or may be accompanied by the remainder of their group, lead line or ambulance, in the movement to the front.

The senior noncommissioned officer is responsible for the transmission of duplicate emergency veterinary tag (M.D. Form No. 115b).

Operation. In the usual situation with the section operating separately, the lead line group becomes the forward portion of a single chain of veterinary evacuation, the ambulance group the rear portion. The point at which animals are transferred from lead line to ambulance becomes a veterinary ambulance loading post. The distance over which animals are moved by these two means varies with such factors as terrain, weather, enemy weapons, total distance involved, and road net. On the other hand, the two groups may operate in different sectors or a division of the task may be made on the basis of type cases to be evacuated by each.

Lead Line. The veterinary leading apparatus consists of the McClellan saddle, blanket, special harness for two horses, and the lead line which is 120 feet (two 60-foot sections) of 3/4-inch manila rope equipped with heavy snaps for the attachment of the animals. Each section normally accommodates 10 animals with a maximum for the two sections of 22. Horses wearing the special harness are placed in file, one in lead, the other in trail, the distance between governed by the length of line to be utilized. The line attaches to the breeching of the lead and the breast collar of the trail horse. A third horse, also equipped with special harness, may be placed in a swing position at the junction of the two sections.

Operation. Normally four men, designated, a veterinary evacuation squad, operates the lead line. Numbered from 1 to 4, No. 3 rides the lead and No. 4 the trail horse while Nos. 1 (the noncommissioned officer in charge) and 2 ride free of the line and parallel to it, one on each side.

Preparation for Movement. The line horses being harnessed, Nos. 3 and 4 place their animals in proper positions, attach the lead line, and mount. Nos. 1 and 2 attach the animals to be evacuated in order from front to rear, coil excess line, if any, about the pommel of the saddle of the trail horse, mount, and take position to right and left.

Movement. The line moves at the command of No. 1, the lead horse maintaining a moderate tautness of the line without retarding movement.

Turns. In making a right (left) turn, No. 3 executes a right (left) oblique No. 4 a left (right) oblique, Nos. 1 and 2 meanwhile grasping the line or halter of the led animals move the central portion of the line to the left (right) to avoid contact with trees, fences, or buildings which may be on the corner.

Reversing Line. To reverse line the squad halts, Nos. 2, 3, and 4 dismount, and No. 2 hands the reins of his mount to No. 1. He then unsnaps the line from the breast collar of the trail horse and snaps it to the breeching after the horse has been reversed by No. 4. He repeats the process with the lead horse, then all mount and move out. The former trail horse becomes the lead horse, and vice versa.

Precautions. Adjust harness to insure strain on lead horse is taken on the traces and the strain on the trail horse by the breeching. Lack of proper adjustment places strain on back straps. In operation of the line, the slower horse should be placed in the lead.

Turning corners must be executed at the walk.

Veterinary Ambulance. The term veterinary ambulance may be applied to any vehicle capable of transporting sick or injured animals. The two units now provided are a truck, 1½-ton, 4 x 4 cargo and trailer, 2-wheel, 2-horse van; and a truck, tractor, 4-5 ton, as the prime mover with a semitrailer, 6-ton, animal carrier.

The ambulances now provided for the veterinary company, separate, are the larger units capable of carrying patients. The veterinary troop is provided with both the units referred to above. All sharp edges and projecting surfaces of the inside of the body are padded to prevent further injury to animal casualties being transported. Slings for supporting indicated cases are highly desirable.

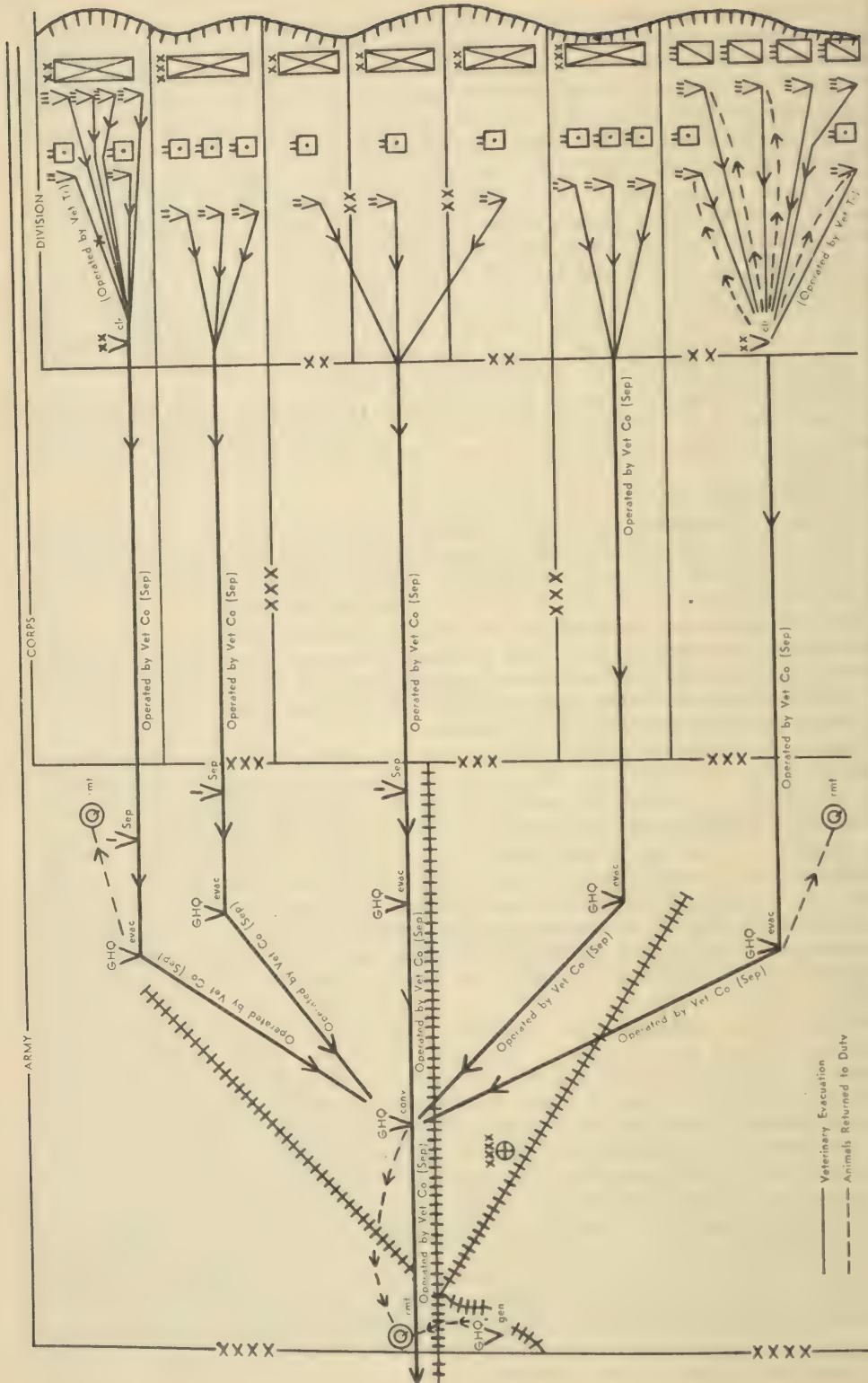
The rear end of the truck is so constructed that it will open out as a ramp for loading and unloading. When lowered for use its slope should not be greater than 25° from the horizontal. If wooden, the ramp is equipped with cleats affixed about 6 inches apart, and if metallic, it is covered entirely with canvas to prevent slipping.

Functions. In addition to transporting animal casualties to the rear, the veterinary ambulance may be utilized to move one lead line group complete with animals to the front. If an ambulance so moves a lead line group, the point at which the group is unloaded usually becomes the veterinary ambulance loading post.

A veterinary ambulance is operated by an ambulance group which in the veterinary company separate consists of a corporal (in charge), a chauffeur, and three ambulance orderlies.

Preparation for Loading. The corporal of the ambulance group is in charge of ambulance loading and unloading. The ambulance being at the loading post, the ambulance is turned and the ramp lowered and properly adjusted. The floor of the ambulance is checked to assure proper sanding or other method being utilized to preclude unnecessary slipping of the animals. The animals are then checked to determine the type case(s) and the condition of splints, bandages, or other dressing. Any adjustment or change of the latter is accomplished prior to loading.

Loading. Several methods of animal loading are described in FM 25-5. All ambulance personnel participate in the loading. Unruly animals are given an early priority. The animals are led into the vehicle by means of a ramp which is a tail-end lowered, and are placed in the truck in rows facing the front. Animals with communicable diseases are loaded in a separate ambulance if one is available. If not available the arrangement is altered, cases with conditions other than communicable being placed in the front with their heads in one direction, those with communicable diseases being placed in the rear with their heads in the opposite direction.



The ambulance orderlies are responsible for the technical procedures incident to the care and treatment of the animals. The corporal and the chauffeur are responsible for the actual loading, the securing of the animals within the ambulance, and the closing of the tailgate and any other preparation of the ambulance prior to movement.

During movement, the ambulance orderlies ride in a space provided in front of the patients, in the two-patient unit; in the eight-patient unit, space is provided for orderlies in front of each row of four patients. The non-commissioned officer in charge of each ambulance unit rides in the cab with the chauffeur.

Unloading. The ambulance being in the most advantageous position, the ramp is lowered, the animals untied, and led off the truck in single file by the ambulance personnel. Usually the personnel of the receiving unit take over the animals at the unloading point.

Precautions. Extra ropes should be carried by the ambulance for use in emergencies such as the loading of unruly animals.

The inside of the ambulance must be thoroughly cleansed and disinfected after the transportation of animals with communicable disease, whether diagnosed or suspected.

The personnel of the company should be selected from men familiar with animals, who instinctively like animals and have no fear of them. Such individuals are found among men from farms and farming communities. Men who have been employed previously in livery stables, blacksmith shops, or teamsters are highly desirable. In addition to the basic qualifications of all non-commissioned officers those of the separate veterinary company should possess these characteristics enumerated.

Training. In addition to the subjects outlined in the basic training of the Medical Department soldier and those included for the personnel of the animal-drawn ambulance battalion, the following subjects are emphasized:

- Emergency veterinary tag, its uses and dispositions (see TM 8-450 and AR 40-2245).

- Terminology commonly used in veterinary diagnoses.

- Animal casualties and casualty classification for purposes of transportation.

- Elementary veterinary anatomy and physiology.

- Veterinary first aid, care and treatment of sick and wounded animals during transportation.

- Animal ambulance loading and unloading.

- Operation of lead lines.

- Methods of handling unruly animals.

- Tactics of units employing animals, with emphasis on horse-drawn and pack artillery and horse cavalry.

- General operative procedure of other mobile veterinary units.

In addition to the training common to all chauffeurs the chauffeurs of the veterinary ambulances are trained in the supervision of loading and unloading, care and maintenance of their vehicles, limitations of the veterinary ambulance as to terrain and weight capacity, and the care and treatment of animals during transportation.

The corporal from company headquarters is trained in the duties of company clerk and the appropriate specialist clerk (also in company headquarters) is trained in the preparation of records and returns pertaining to the animal casualties handled by the company.

Since the platoon is the basic operating element, most of the unit training will be by platoon. The platoon is trained as a whole in its tactical functioning, marches, bivouacing as a unit, care and nomenclature of organizational equipment and transport, establishment and operation of ambulance loading posts and the evacuation of animal casualties (simulated), communications available to the platoon, and the operation of lead lines and motor transport by day and by night over varying types of terrain.

The combined training of the company or elements thereof is conducted by the army surgeon or his representative, the army veterinarian. Such training is combined with that of such elements of the second, third, and fourth echelons of veterinary service as may be available and feasible. The company commander is responsible for the participation of his unit or an element thereof.

Installations. The company or elements thereof establish and operate the following installations:

The company headquarters is the installation established in bivouac or during combat for the purposes of company control and administration. It includes the company CP, the housekeeping and maintenance facilities of the company, and the headquarters of one or more of its integral platoons.

During operations (FM 8-15) it is *located* with a view to attaining the maximum contact with the functional elements of the company. Usually this will be in the vicinity of the veterinary evacuation hospital(s) to which the company is evacuating animal casualties. It should be forward of such installations and along the route being utilized by the bulk of the units. Having arrived at the site of the installation, the company commander designates the locations of the various elements. The company message center and the CP of platoon(s) operating with the company headquarters are placed adjacent to the route of evacuation. Otherwise, there is no conventional arrangement for the installation.

Operation. The company CP is the office of the company commander and in his absence is operated by his assistant or by the first sergeant. It is the seat of all company records and the place where reports and returns concerning casualties evacuated are consolidated and prepared for forwarding to higher authority.

The *message center* is operated by the company clerk who keeps a record of all messages coming to or going from the company, or being transmitted by the leaders of the functional groups (ambulance or lead line).

The company *mess* is operated by the appropriate personnel and during combat is prepared to serve hot meals at all hours. The peculiar characteristics of the company necessitate the messing of the bulk of the company as the opportunity presents itself. Cooked food may frequently be prepared at company headquarters and carried by truck to platoons operating within a reasonable distance of the installation. If the distance precludes such method, the involved element(s) are attached for rations to a convenient Medical Department unit.

The *unit supply* includes the supply officer (usually the commander's commissioned assistant), the supply sergeant, and such other enlisted personnel as is indicated. The company supply officer is the accountable officer of the unit. He procures all the supplies required by the company and operates a distributing point at the company headquarters. During combat, platoons operating separately usually will obtain necessary veterinary supplies from the veterinary (evacuation) hospital which it is serving. Under the supervision of the unit supply, each platoon operates its own property exchange for such items as halters, blankets, etc.

The *motor sergeant* and the automobile mechanics supervise the care and maintenance of all the motor transport of the company, make such repairs as their facilities allow, and arrange with higher motor repair echelons for such as they are unable to perform.

The *stable sergeant* has general supervision over the care and feeding of all the animals of the company and the maintenance of their equipment.

March Collecting Posts. Although normally established and operated by second echelon veterinary service, march collecting posts may be established by elements of the company.

Veterinary Ambulance Relay Posts. If the situation indicates the shuttle system of ambulance evacuation, relay posts are established as for the parallel operation of ambulances evacuating sick and injured personnel (see FM 8-10).

Veterinary Ambulance Loading Posts. Although normally established by first or second echelon veterinary service, veterinary ambulance loading posts may be established and operated by elements of the company. The installation is placed as far forward as the roads and the military situation permit and is operated by the ambulance group. Terrain features are used to best advantage for the purpose of concealment and protection of the vehicle. An embankment, a mound, or the side of a hill may facilitate loading by reducing the grade of the ramp. Ambulances should be turned before loading.

Employment. In the allotment of a task to platoon or section the internal organization of such elements is kept tactically intact whenever possible, one element being assigned to one chain of veterinary vacuation. A platoon or an element thereof may be attached to a subordinate echelon when its operation by the army veterinary service is impracticable or when reinforcement of the veterinary service of a subordinate echelon is indicated. Such attachment, except for rations is to be avoided whenever possible.

Administration. The company is charged with the usual personnel administration of a separate unit, the company morning report, reports of casualties (company personnel), requests for replacements, and other required reports and returns being forwarded direct to army headquarters.

Animals. The morning report of animals, reports of animal casualties, etc., are prepared by the company (headquarters) and disposed similarly to personnel reports.

Casualties Evacuated. All reports and returns concerning animal casualties evacuated by the company are consolidated in company headquarters from information submitted by the platoons and forwarded to higher authority as required.

Messing. The company normally operates one mess at the company headquarters, serving meals to personnel as their duties bring them in contact with the headquarters, or distributing cooked meals to elements of the company operating in the general vicinity of the headquarters. Neither plan being feasible, elements of the company are attached for rations to convenient Medical Department units.

Supplies. Class I supplies are received automatically, either at the company headquarters or at the nearest distributing point established for army troops. Supplies other than class I normally are procured by formal or informal requisition from the nearest appropriate depot. In emergencies veterinary supplies are obtained from the nearest veterinary hospital.

Care of Sick and Injured. In bivouac, sick and injured personnel are reported to designated medical installations within the area; during combat, they are reported to the most available aid station.

CHAPTER V

THE MEDICAL SERVICE OF A FIELD FORCE

Introduction. This chapter seeks to formulate the responsibilities of the Medical Department in a field force and to describe the organization and the operation of the agencies provided by laws, regulations, and plans for such purpose. This service must be organized and shaped in general conformity with Tables of Organization (See Chapter IV, Part I.) prescribing the ground and air forces and the specific war plan covering the enterprise for which the task force is created.

Behind the tactical units lie the important activities of the Medical Department designed to provide for the definitive treatment and the ultimate care of war casualties. Being predicated upon the general mobilization plan and the specific war plan involved, the organization and operation of the Medical Department within the field force is coordinated with the general policies of The Surgeon General in providing the medical service within the zone of the interior. This involves matters of personnel incident to mobilization not only of the field force but of that part of the home population which is militarized; it includes also the general plan for medical attendance, hospitalization, and sanitation and the procurement, distribution, and replenishment of medical, dental, and veterinary supplies.

ORGANIZATION

General Plan of Organization. Based upon the above plans and policies there must be worked out the organization of the Medical Department within the task force, including the organization of the office of the chief surgeon and of the surgeon of the communications zone and its various sections, if there be any, and the necessary contact with the general staff and the surgeons of the armies or groups of armies in order to establish the means of controlling the activities of the Medical Department within the force. These will include, in general, all activities which have their counterpart in the medical service of the zone of the interior, such as personnel, medical attendance, sanitation, equipment and supply, but with added attention necessary in the matters of the strategical distribution of medical units, equipment and supplies, the utilization of specialized personnel, and the formulation of policies regarding professional treatment and the all important matters of evacuation and hospitalization.

The Medical Service Functions. The Medical Department within a field force is classified as one of the technical, supply, and administrative services. As such its functions are as follows:

General functions. The preservation of the strength of the forces in the field, accomplished by the care and treatment of the sick and injured men and animals of all military forces and the conversion of casualties into replacements whenever possible.

Specific functions. The specific functions of the Medical Department are:

The initiation of sanitary measures to insure the health of troops.

The direction and supervision of all public health measures among inhabitants of occupied territory.

The care of the sick and wounded men and animals, in camp, on the march, on the battlefield and after removal therefrom.

The methodical disposition of the sick and wounded, so as to insure the retention of the effectives and to relieve the fighting force of the non-effectives.

The transportation of the sick and injured.

The establishment and operation of hospitals, dispensaries, and other installations necessary for the care of the sick and injured.

The supply of material necessary for the prevention of disease among the troops and for the care of the sick and injured.

The preparation and preservation of records of sickness and injury, for the immediate information of higher authority and to assist in the adjudication of claims with justice both to the government and to the individual.

Chief Surgeon's Office, General Headquarters. The War Department, upon the recommendation of The Surgeon General, assigns a medical officer, who is acceptable to the commanding general of the Army ground Forces and to the Commander of the task force, as chief surgeon. This officer becomes a member of the "special staff" of the commanding general of the force. Under the commanding general he controls all Medical Department activities within the theatre of operations through the coordination of the general staff at general headquarters (GHQ).

It is necessary that the chief surgeon maintain his office at GHQ in order that he may keep in close touch with the commander in chief and his general staff. As the GHQ is concerned with broad matters of policy and strategy, rather than with the details of administration and operation, the chief surgeon's office is organized so as to fulfill its staff functions chiefly through direct cooperation with the divisions of the general staff at that headquarters. For this purpose, a medical officer or group of officers may be assigned to maintain immediate liaison with each division of the general staff liaison officers. While so serving, they may be actually located in the office of the chief surgeon or in the general staff offices, according to the policy announced by GHQ. Questions arising within all sections that in any way affect the Medical Department come before these officers for comment before being finally decided, and their recommendations should be in accordance with the policies of the chief surgeon.

The chief surgeon must spend much of his time away from GHQ, for only in this manner can he keep himself well informed as to the status of the medical service in the theatre of operations. Therefore, it is necessary for him to have an assistant at GHQ, who is the deputy or assistant chief surgeon of the force and who acts for the chief surgeon when he is absent. This assistant should be a medical officer of wide experience and one who is familiar with general staff work.

The Medical Headquarters GHQ. The medical headquarters at GHQ consists of:

Chief surgeon. The chief surgeon has general control of Medical Department activities and of policies which concern the department.

Deputy or assistant chief surgeon. The deputy or assistant chief surgeon acts for the chief surgeon when he is absent.

Liaison with general staff sections. Medical officers are detailed for liaison with the general staff sections as follows:

One for *liaison with the personnel section (G-1)* who is concerned with medical replacements, sanitation, and sanitary inspections, including those necessary in the administration of military government of occupied territory, casualty records, and general activities of the Red Cross.

One for *liaison with the intelligence section (G-2)* who is concerned with military intelligence of value to the Medical Department.

One for *liaison with the operations and training section (G-3)* who is concerned with movement orders of all Medical Department units and all matters of organization and training pertaining to the Medical Department.

One for *liaison with the supply section (G-4)* who is concerned with matters dealing with evacuation, hospitalization, and medical supply for men and animals; Red Cross hospital and supply activities and Medical Department troops in general headquarters reserve.

The chief veterinarian acts as supervising head of the veterinary service.

Other Assistants to the Chief Surgeon. The following, while operating directly under the office of the chief surgeon, are located in the Medical Department Concentration Center or other convenient points:

Chief of professional services. The chief of professional services coordinates the activities of the medical, surgical, dental, and aviation medical services, but solely in an advisory capacity.

Consultants and assistants. Consultants and assistants include such other commissioned personnel as may be necessary to insure efficient operation of the medical service.

The role of the medical groups assigned to regulating stations which are established and administered under the direction of G-4, GHQ, is discussed under the heading "Regulating Station," below.

Units Under Immediate Control of the Chief Surgeon. The chief surgeon keeps under his immediate control (usually at the Medical Department Concentration Center) such medical units as he wishes to hold as GHQ reserves for the purpose of augmenting the medical service within a particular army. These reserve units may include *evacuation hospitals, surgical hospitals, veterinary evacuation hospitals, auxiliary surgical groups, medical gas treatment battalions, medical motor ambulance battalions, medical animal-drawn ambulance battalions, field hospitals, and medical sanitary companies.* The first three mentioned are army units primarily and are discussed in Chapter IV.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Unit	Technician grade	Headquarters	24 surgical teams *	6 orthopedic teams *	6 shock teams *	6 gas teams *	4 maxillo-facial teams *	4 neuro-surgical teams *	4 thoracic-surgical teams *	4 miscellaneous teams *	3 dental-prosthetic teams *	Total	Enlisted cadre	Remarks
Colonel		1										1		* 1 surgical team consists of— 1 general surgeon. 1 assistant general surgeon. 1 anesthetist. 1 nurse.
Lieutenant colonel														* 1 orthopedic team consists of— 1 orthopedic surgeon. 1 nurse.
Major		24	3				(44) 8	4	4	2	4	48		* 2 surgical technicians.
Captain		24	3	6	6			4	4	2		50		* 1 shock team consists of— 1 general surgeon. 1 nurse.
First lieutenant												32		* 2 surgical technicians.
Total commissioned		3	72	6	6	6	8	12	12	4	3	132		* Dental Corps. * 1 gas team consists of— 1 officer, specially trained in treatment of chemical casualties. 2 nurses.
Nurse		2	24	6	6	12	8	4	4	4		70		2 medical technicians.
First sergeant (385)		1										1	1	* 1 maxillo-facial team consist of— 1 plastic surgeon. 1 oral surgeon. 1 nurse-anesthetist. 1 nurse.
Staff sergeant, including Mess (824)		(1)										(1)	(1)	* 1 thoracic-surgical team consists of— 1 thoracic surgeon. 1 assistant operating surgeon. 1 anesthetist. 1 nurse.
Sergeant, including Section leader (552)		(2)										(2)	(2)	* 2 surgical technicians.
Supply (821)		(1)										(1)	(1)	* Specialists not otherwise provided for and as directed.
Supply, medical (823)		(1)										(1)	(1)	* 1 dental prosthetic team consists of— 1 prosthetist.
Corporal, including Clerk-typist (405)		(1)										(1)	(1)	* 3 dental technicians, one of whom drives dental laboratory.
Technician, grade 5		(1)										(1)	(1)	* Medical Administrative Corps. * Principal chief nurse and assistant chief nurse.
Private, first class		44	48	12	12	12	8	8	8	8	9	217		* Includes 4 nurse-anesthetists.
Private												17		The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
Chauffeur (344)		(3)										(3)		
Chauffeur (345)		(3)										(3)		
Clerk, general (555)		(1)										(1)		
Clerk-typist (405)		5										(1)		
Cook (560)		(4)										(4)		
Cook (560)		5										(5)		
Cook's helper (521)		(9)										(9)		
Mechanic, automobile (014)		5										(5)		
Orderly (695)		(10)										(10)		
Stenographer (215)		4										(4)		
Technician, dental (067)		8					(6)	(4)			(3)	(6)		
Technician, medical (123)		8					(6)			(4)		(6)		
Technician, medical (123)		4		(34)	(6)	(6)		(4)	(4)	(4)		(44)		
Technician, surgical (225)		5		(34)	(6)	(6)		(4)	(4)	(4)		(32)		
Basic (531)		(5)										(5)		
Total enlisted		51	48	12	12	12	8	8	8	8	9	176	6	
Aggregate		56	144	24	24	30	24	24	24	16	12	378	6	
Car, 5-passenger, light sedan		3										3		
Truck, 3½-ton, weapon carrier		1										1		
Truck, 1½-ton, cargo		2										2		
Truck, 2½-ton, dental laboratory											3	3		

Plate 1. T/O 8-571, July 13, 1942. Organization of the Auxiliary Surgical Group.

The Medical Department Concentration Center (T/O 8-600-1) is also a GHQ reserve unit, although its local administration may be supervised by the surgeon of the communications zone. This unit provides the administrative overhead for the units in GHQ reserve and for Medical Department replacements. A center of this character permits units to be prepared for service, overhauled, and refitted under coordinated control at one place, instead of being scattered by single units throughout the theatre of operations. This concentration of units also facilitates the solution of supply and replacement problems.

The Auxiliary Surgical Group (T/O 8-571) is a GHQ reserve unit. These groups are authorized at the rate of one per army in the field. The teams constituting them are employed at hospitals either in the combat zone or communications zone, wherever their

	1	2	3	4	5	6	7	8
	Unit	Battalion headquarters (T/O 8-126) ^a	Headquarters and headquarters detachment (T/O 8-126)	3 clearing companies (each) (T/O 8-127)	Total battalion	Attached chaplain	Enlisted cadre	Remarks
2	Lieutenant colonel.....	(b 1)	1		1			Personnel shown in column 2 included in column 3. ^b Battalion commander. ^c Medical Administrative Corps. ^d Dental Corps. * Qualified warrant officers, when available, may be used to replace these officers; 1 qualified in motor maintenance, 1 qualified in personnel administration.
3	Major.....	(1)	1		1			
4	Captain.....	(1)	(c) 2	5	17			
5	First lieutenant.....	(a 1)	* 2	(c) 1	23	1		
6	Second lieutenant.....		** 2	7				
7	Total commissioned.....	(4)	8	12	44	1		
8	Master sergeant.....		1		1		1	
9	First sergeant.....		1	1	4		4	
10	Technical sergeant.....		3		3		3	
11	Staff sergeant.....		2	8	11		2	
12	Sergeant.....		4	8	28		4	
13	Corporal.....		1	3	10		4	
14	Technician, grade 4.....		4	10	34		18	
15	Technician, grade 5.....		8	15	53		12	
16	Private, first class.....		9	42	135			
17	Private, including.....		13	55	178			
18	Basic.....		(5)	(14)	(47)			
19	Total enlisted.....		46	137	457		48	
20	Aggregate.....		54	149	501	1	48	
21	E Trailer, shower bath.....			2				
22	Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....				6			
23	Q Truck, 1½-ton.....		1	5	16			
24	Q Truck, ¾-ton, command and reconnaissance.....		2	2	8			
25	Q Truck, ¾-ton, weapon carrier.....			1	3			
26	Q Truck, 2½-ton, cargo.....		3	1	6			
27	Q Truck, 2½-ton, wrecker, with winch.....		4	11	37			
			1		1			

Plate 3. T/O 8-125, August 11, 1942, Medical Gas Treatment Battalion.

	1	2	3	4	5	6	7
	Unit	Technician grade	Company head-quarters	3 clearing platoons (each) ^a	Total company ^b	En-listed cadre	Remarks
2	Lieutenant colonel.....		1		1		
3	Major.....			1	3		
4	Captain.....			2	6		
5	Lieutenant.....		1	(d 1)2	7		
6	Total commissioned.....		2	5	17		
7	Nurse ^c			6	18		
8	First sergeant (585).....		1		1	1	
9	Staff sergeant, including.....		3	1	6	4	
10	Mess (824).....		(1)		(1)	(1)	
11	Motor (813).....		(1)		(1)	(1)	
12	Platoon leader (651).....			(1)	(3)	(1)	
13	Supply (821).....		(1)		(1)	(1)	
14	Sergeant, including.....			2	6	2	
15	Section leader (652).....			(2)	(6)	(2)	
16	Corporal, including.....		1	1	4	2	
17	Clerk, admission (055).....			(1)	(3)	(1)	
18	Clerk, company (405).....		(1)		(1)	(1)	
19	Technician, grade 4.....				9	4	
20	Technician, grade 5.....				34	9	
21	Private, first class.....		14	60	65	2	
22	Private.....				86		
23	Bugler (803).....		(1)		(1)		
24	Cook (060).....	4	(1)	(1)	4	(3)	
25	Cook (060).....	5	(1)	(2)	(7)	(3)	
26	Cook's helper (521).....		(1)	(1)	(4)		
27	Driver, heavy truck (345).....	5	(1)	(3)	(10)	(3)	
28	Driver, heavy truck (345).....			(4)	(12)		
29	Driver, light truck (345).....		(2)	(3)	(11)		
30	Mechanic, automobile (014).....	4	(2)		(2)		
31	Mechanic, automobile (014).....	5	(2)		(2)		
32	Orderly (695).....		(1)	(1)	(4)		
33	Orderly, hospital, medical (303).....			(9)	(27)		
34	Orderly, hospital, surgical (303).....			(12)	(36)		
35	Pharmacist (149).....			(1)	(3)	(1)	
36	Technician, dental (067).....	5		(1)	(3)	(1)	
37	Technician, medical (123).....	5		(2)	(6)	(1)	
38	Technician, medical (123).....			(4)	(12)		
39	Technician, sanitary (196).....		(2)		(6)	(1)	
40	Technician, surgical (225).....	4		(1)	(3)	(1)	
41	Technician, surgical (225).....	5		(2)	(6)	(1)	
42	Technician, surgical (225).....			(5)	(15)		
43	Basic (521).....		(2)	(6)	(20)		
44	Total enlisted.....		19	64	211	24	
45	Aggregate.....		21	75	246	24	
46	Q Ambulance, ¾-ton.....			2	6		
47	Q Trailer, 1-ton, 2-wheel, water tank (250-gallon).....		1	1	4		
48	Q Truck, ¾-ton, command and reconnaissance.....		1	1	4		
49	Q Truck, ¾-ton, weapon carrier.....		1		1		
50	Q Truck, 2½-ton, cargo.....		1	6	19		
51	Q Truck, 2½-ton, cargo, with winch.....			1	3		

^a Normal bed capacity of 1 platoon when acting independently is 100.

^b Normal bed capacity of company is 380.

^c Medical Administrative Corps.

^d Dental.

^e Nurses normally will accompany the unit when assigned on a functional basis. While on a training basis they are not assigned.

The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.

Plate 4. T/O 8-510, February 28, 1942. Field Hospital.

Plate 5. T/O 8-315, April 1, 1942. Medical Ambulance Battalion, Motor.

1	Unit	Technician grade	Headquarters detachment					3 medical companies, ambulance (each)					Remarks
			Battalion headquarters and personnel section	Detachment headquarters section	Battalion supply section	Motor maintenance section	Total headquarters detachment	Company headquarters	3 platoons (each)	Total company	Total (headquarters detachment and 3 companies)		
2	Lieutenant colonel	a1					1	1	1	1	1	1	Private—Continued. Q Ambulance, 1/2-ton, 2-wheel, Trailer, 1-ton, 2-wheel, water. Q Truck, 1/2-ton, carry-all. Q Truck, 1/2-ton, command and reconnaissance. Q Truck, 1/2-ton, weapon including. Q Truck, 2 1/2-ton, cargo, including. Q Cargo. Q Mess. Q Wrecker.
3	Captain	a1	b1				1	1	1	1	1	1	
4	First lieutenant	a2	b1				1	1	1	1	1	1	
5	Second lieutenant	a2	b1				1	1	1	1	1	1	
6	Total commissioned		4	1	1	1	6	1	1	4	18		
7	Warrant officer												
8	Master sergeant, including												
9	Motor (813)												
10	Sergeant major (302)												
11	First sergeant (885)												
12	Technical sergeant, including												
13	Technical sergeant (885)												
14	Supply (821)												
15	Staff sergeant, including												
16	Staff sergeant (885)												
17	Staff sergeant (885)												
18	Platoon leader (631)												
19	Sergeant, including												
20	Motor (813)												
21	Platoon leader (631)												
22	Message center chief (654)												
23	Section leader (632)												
24	Supply (821)												
25	Corporal, including												
26	Assistant section leader (632)												
27	Technician, grade 4 (405)												
28	Technician, grade 5 (405)												
29	Private, first class												
30	Private, first class (654)												
31	Private, first class (654)												
32	Chauffeur (344)												
33	Chauffeur (344)												
34	Clerk, headquarters (855)												
35	Clerk, headquarters (855)												
36	Clerk, headquarters (855)												
37	Cook (950)												
38	Cook (950)												
39	Cook's helper (521)												
40	Mechanic, automobile (014)												
41	Mechanic, automobile (014)												
42	Ordnance (654)												
43	Ordnance (654)												
44	Orderly, ambulance (686)												
45	Painter, general (144)												
46	Painter, utility (121)												
47	Basic (821)												
48	Total enlisted		19	18	8	14	59	20	26	98	353	49	
49	Aggregate		23	19	9	15	66	21	27	102	372	49	

Plate 5. T/O 8-315, April 1, 1942. Medical Ambulance Battalion, Motor.

services are needed. They may be used to augment the personnel of evacuation and surgical hospitals of an army. In each surgical group there are an *administrative headquarters, surgical teams, splint teams, shock teams, gas teams, maxillo-facial teams, research teams, and other teams for miscellaneous assignment*. The teams are organized so as to permit them to be sent equipped for work to any part of the front or to the rear. The personnel is specially selected for their professional attainments.

Tables for other units which may be held in reserve or rehabilitated in the medical department concentration center of the GHQ are shown in this chapter.

The Surgeon, Communications Zone. At the headquarters of the communication zone, a medical officer is detailed on the staff of the commanding general as the surgeon, communications zone.

The officer, under the commanding general, supervises Medical Department activities within the communications zone. He has under his supervision all medical units in that zone except those retained under the direct control of the chief surgeon of the field force. The units under the direct supervision of the surgeon, communications zone, are *general hospitals, hospital centers, convalescent camps, general dispensaries, the general medical laboratory, the communications zone laboratories, sanitary companies, veterinary general hospitals, and those hospital trains* which are assigned for his use. He maintains technical supervision over medical sections of general supply depots, station hospitals, veterinary station hospitals, and other Medical Department activities under the control of local commanders.

The Office of the Surgeon, Communications Zone (T/O 8-500-1). The office of the surgeon, communications zone, is organized on a functional basis, *i.e.*, into sections concerned with the several activities that together comprise the responsibility of the Medical Department as an administrative, technical, and supply service. Activities of the Medical Department are coordinated through the general staff of the communications zone. Liaison with the general staff sections, on important matters, is conducted by the chiefs of sections of the office of the communications zone surgeon. Every officer, however,

	1	2	3	4
	Unit	Technician grade	Total detachment ^a	Remarks
1	Captain.....		b 1	^a For theaters of 50,000 men or larger.
2	Total commissioned.....		1	^b Sanitary Corps.
3	Technical sergeant.....		1	This detachment to be assigned within the theater on the recommendation of the theater surgeon.
4	Technician, grade 4.....		2	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR-615-26. A number above 500 refers to a military occupational specialist listed in Circular No. 14, War Department, 1942.
5	Technician, grade 5 including.....		1	
6	Private, first class.....		2	
7	Artist, clinical (296).....	4	(1)	
8	Carpenter-packer (203).....		(1)	
9	Chauffeur (345).....		(1)	
10	Clerk, record (055).....	5	(1)	
11	Photographer, clinical (152).....	4	(1)	
12	Total enlisted.....		6	
13	Aggregate.....		7	
14	Q Truck, ¾-ton, carry-all.....		1	

Plate 6. T/O 8-697, April 30, 1942. Medical Detachment, Museum and Medical Arts Service.

whether he is a section chief or not, should maintain active liaison not only with the general staff officers in matters with which he is concerned but also with the representatives of other supply branches, *e.g.*, the Quartermaster, Engineer, etc.

The sections and sub-sections of the surgeon's office, communications zone, with duties assigned to each are as follows:

Administrative section. This section supervises the operation of the entire office.

s personnel includes the surgeon, the deputy surgeon, and the office executive. It may have subsections as follows:

The *office service subsection* deals with the interior office administration such as filing, records, receipt and dispatch of official mail, courier service, information, printing, mimeographing, and stenographic work.

	1	2	3	4	5	6	7	8	9
	Unit	Specialists' ratings (class)	Squadron headquarters	Headquarters section	Ambulance section, single engine, transport	2 ambulance sections, 2 engine, transport (each)	Total squadron (squadron headquarters; headquarters section; 1 ambulance section, single engine, transport; and 2 ambulance sections, 2 engine, transport)	Enlisted cadre	Remarks
1									<ul style="list-style-type: none"> * Commanding officer, squadron, airplane ambulance. * Executive officer and squadron liaison officer. * Commanding officer, section airplane ambulance. * Includes 1 dental officer. * Airplane ambulance surgeons.
2	Lieutenant colonel.....	a 1					1		* 1 assistant to commanding officer and liaison officer, section airplane ambulance; 1 section aid station surgeon; 6 airplane ambulance surgeons.
3	Major.....	b 1			o 1	o 1	4		* 1 assistant to commanding officer and liaison officer, section airplane ambulance; 1 section aid station surgeon; 12 airplane ambulance surgeons.
4	Captain.....			d 2	f 2	s 2	8		This organization is the companion medical organization for the Air Corps transport group (T/O 1-352 and 1-357). When necessary suitable light airplanes capable of operating from small fields will be substituted in the Air Corps squadron transport (bi-engine) on the basis of 18 single-engine airplanes for 12 bi-engine airplanes.
5	First lieutenant.....			e 2	f 6	s 12	32		Medical personnel will be messed with Air Corps or Army units to which they are attached.
6	Total commissioned.....		2	4	9	15	45		<i>Summary of specialists' ratings</i>
7	First sergeant (585).....			1			1	1	
8	Staff sergeant, including.....		1	1	1		4	2	
9	Medical technician (123).....			(1)	(1)		(3)	(1)	
10	Motor (068).....			(1)			(1)	(1)	
11	Sergeant, including.....		1	6	1		9	3	
12	Clerk, administrative (055).....			(1)			(1)	(1)	
13	Medical technician (123).....				(6)		(6)	(1)	
14	Surgical technician (225).....					(1)	(2)	(1)	
15	Corporal, including.....		1	1	3		8	2	
16	Clerk, administrative (055).....			(1)	(1)	(1)	(4)		
17	Medical technician (123).....				(1)		(2)	(1)	
18	Surgical technician (225).....					(1)	(2)	(1)	
19	Private, first class.....						(2)	(1)	
20	Private.....			28	56	56	66	9	
21	Chauffeur (245).....	5th		(3)	(2)	(3)	(11)		
22	Chauffeur (245).....	6th		(3)	(3)	(4)	(14)		
23	Clerk, administrative (055).....	4th		(1)			(1)		
24	Clerk, administrative (055).....	5th			(1)	(1)	(3)		
25	Mechanic, automobile (014).....	3d		(1)			(1)		
26	Mechanic, automobile (014).....	4th		(1)			(1)		
27	Orderly, ambulance (696).....				(8)	(12)	(32)		
28	Technician, dental (067).....	4th		(1)			(1)	(1)	
29	Technician, medical (123).....	4th			(2)	(2)	(6)	(2)	
30	Technician, medical (123).....	5th			(4)	(3)	(10)		
31	Technician, medical (123).....	6th		(5)	(6)	(6)	(23)	(2)	
32	Technician, surgical (225).....	3d		(5)	(3)	(2)	(12)	(2)	
33	Technician, surgical (225).....	4th			(9)	(7)	(23)		
34	Technician, surgical (225).....	5th		(5)	(12)	(10)	(37)	(2)	
35	Basic (521).....			(3)	(6)	(6)	(21)		
36	Total enlisted.....			32	64	61	218	17	
37	Aggregate.....		2	36	73	76	263	17	
38	Q Ambulance, field, cross country.....				2	4	10		
39	Q Car, sedan, 5-passenger.....				1	1	1	4	
40	Q Truck, ¼-ton.....				4	1	1	7	
41	Q Truck, 1½-ton, cargo.....				1	1	1	4	

Plate 7. T/O 8-455, November 19, 1941. Medical Air Ambulance Squadron.

The *detachment subsection* administers, as a company or detachment, the enlisted men on duty in the office. It details chauffeurs, orderlies, clerks, etc., for the various sections and keeps the personnel records and the reports of the enlisted men who are members of the organization.

The *historical subsection* formulates the plans for collection of historical data and

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Unit	Specialists' ratings (class)	Adm in strative section	Hospitalization section	Supply section	Personnel section	Evacuation section	Sanitation section	Vital statistics section	Consultant section	Dental section	Veterinary section	Total	Remarks
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
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27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													

The appointment of the general officer shown on this table will not be made unless specially authorized by the War Department.

a Additional enlisted personnel required by section will be furnished from the administrative section pool.

b Deputy surgeon.

c Medical inspector.

d Dental.

e Medical and surgical consultants.

f Executive officer.

g Epidemiologist; food and nutrition officer.

h Meat, meat food, and dairy products inspector.

i May be Medical Administrative Corps.

j Principal and assistant chief nurse.

k Veterinary.

Summary of specialists' ratings

Class	Number
3d	4
4th	10
5th	19
6th	8
Total	41

The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in section I, AR 615-28. A number above 500 refers to a military occupational specialist listed in section II, AR 615-26.

Total enlisted.....

Aggregate.....

Car, light, 5-passenger sedan.....

Truck, 1/2-ton, command.....

maintains liaison with all other agencies concerned with the collection and preparation of histories, especially the historical branches of general staff sections.

Hospitalization section. This section will usually be the largest and most important as it controls the majority of the fixed hospitals of the communications zones. The section will usually have the following subsections:

The *procurement and construction subsection* deals with hospital projects; transfer of hospitals and property from civil ownership to the Medical Department and vice versa; offers of land and buildings for hospital purposes; leasing of lands and buildings; making inventories of the same; hospital plans and construction in liaison with the chief engineer; repairs to hospitals; procurement and distribution of tentage; coordination with the "Rents, Requisitions and Claims Bureau" and Quartermaster Corps; reference maps and graphic charts of projects completed, under construction, and proposed; and inspection and reports relating to the above items.

The *administration subsection* supervises the administration of the hospital centers, general hospitals, convalescent camps, and any other fixed hospitals that may be established under the direct control of the commanding general of the communications zone.

Supply section. The supply section functions under the supervision of a medical officer experienced in all phases of supply work. He and his assistants maintain the necessary statistical data, estimate requirements, and conduct procurement, storage, and distribution of supplies. They maintain liaison with the general staff sections at the several headquarters dealing with matters pertaining to supply. This office may be divided into the following subsections:

The *statistics and requirements subsection* deals with statistical data, issues experience and consumption tables and all information upon which automatic supply or procurement may be based.

The *procurement subsection* deals with the obtaining of supplies by automatic replacement or requisition from the zone of the interior, local purchase or transfer from the Red Cross or an allied power or captured enemy material.

The *storage and distribution subsection* deals with all matters pertaining to the storage and distribution of medical supplies.

The *finance and accounting subsection* is in charge of a medical department officer experienced in military auditing, accounting, and disbursement. He and his assistants supervise, control, or conduct the financial transactions of the chief surgeon's office and all Medical Department functions controlled by it. This subsection may be further divided as follows:

Allotment and disbursing: Dealing with the accounts of available funds, the allocation of funds to projects and the allotment of funds to medical supply or other Medical Department officers for the local purchase of supplies or service, and the handling of disbursements and disbursing accounts.

Auditing: Dealing with the examination of money vouchers in connection with the procurement of supplies or services and the final audit of hospital or other fund statements or accounts pertaining to the Medical Department under the control of the surgeon, communications zone.

Legal: Furnishing legal advice on matters in connection with the activities of the supply and finance divisions with special reference to claims, contracts, and leases.

Personnel section. The personnel section deals with all matters relating to appointment, assignment, transfer, promotion, and returns of personnel. It is important because the functioning of all units of the field force depends upon its conduct. It may be subdivided into the following subsections:

Commissioned:

Medical Corps
Dental Corps
Veterinary Corps

Medical Administrative Corps
Sanitary Corps

Nurse Corps.

Enlisted men of the Medical Department.

Civilian employees of the Medical Department.

Evacuation section. This section deals with primary, secondary, and special evacuation of sick and wounded; transportation and assembly of special classes of patients; estimates of transportation required for sick and wounded; records and statistics of evacuation; hospital train assignment and the use of light railways and waterways.

Sanitation section. This section deals, generally, with all matters pertaining to health and control of disease within the communications zone. Through subordinate agencies, it initiates or directs the execution of special disease-control measures, the conduct of epidemiological studies and procedures for the control of existing or potential epidemic conditions. It exercises general supervision over sanitation by means of sanitary inspections and surveys and promulgates special instructions relative to measures to be taken for the prevention of disease. It also supervises the operation of medical laboratories.

Vital statistics section. This section deals with inspection, correction, and compilation of all statistical data relating to the sick and wounded and correspondence pertaining thereto.

Consultant section. The consultant section acts as an agency in carrying out the policies formulated by the chief of professional services on the staff of the chief surgeons, GHQ. The section must function in cooperation with the hospitalization and personnel section and also with the Medical Department Concentration Center. The officer in charge should possess a wide knowledge of the professional qualifications of the large number of civilian practitioners of the United States who come into active service in time of war in order that assignment may be made in accordance with professional qualifications. It will usually have two subsections: *surgical* and *medical*.

It is imperative that each subsection be supervised by officers who are pre-eminent in that particular branch of medicine and who at the same time possess administrative ability. These officers, in addition to routine duty, prepare the bulletins issued from time to time by the chief surgeon which announce the latest approved methods of technique and treatment for the information of the medical officers of the field force.

The *surgical subsection*, under the supervision of a medical officer of the highest surgical attainments, may be subdivided as follows:

General Surgery

Urology

Orthopedics

X-ray

Nerve and brain surgery

Ophthalmology

Maxillo-facial surgery

Oto-laryngology

The *medical subsection*, under a medical officer of high professional attainments, may also be subdivided as follows:

General medicine

Neuro-psychiatry

Dental section. This section cooperates with the personnel and supply sections and makes recommendations relative to the assignment of dental officers and to the procurement, storage, and issue of dental supplies. It compiles pertinent statistics from current dental reports and returns and recommends policies governing the extent and character of the dental service.

Veterinary section. A veterinary officer of appropriate grade, with a proper number of assistants, conducts this office. It deals with: veterinary hospitalization and evacuation, veterinary supply, veterinary sanitation including inspections of the condition of animals, veterinary statistics, veterinary administration, inspection of all foods of animal origin, inspection of forage, and veterinary public health administration of occupied territory.

Medical Establishments of the Communications Zone. The hospitals of the communications zone and hospital trains are discussed in a succeeding section of this chapter, Hospitalization and Evacuation. Medical depots are discussed in the section relating to supply. A brief description of other medical installations of the communications zone is related in this section.

General dispensary communications zone. (T/O 8-650). These small units are

organized for the purpose of providing medical and dental attendance for the commissioned, enlisted, and civilian personnel on duty at all large military headquarters within the theatre of operations. They are also established to provide general professional attendance in large communities having a floating military population. They may function directly under the communications zone commander or under local command.

	1	2	3	4	5	6	7	8	9	10
1	Unit	Technician grade	Headquarters section	Medical section ^a	Surgical section ^b	Eye, ear, nose, and throat section ^c	Dental section ^d	Total	Enlisted cadre	Remarks
2	Lieutenant colonel.....	1						1		
3	Major.....			1	1		4	1		
4	Captain.....			1	1		4	1		
5	First lieutenant.....			1	1		4	1		
6	Total commissioned.....	2	3	2	2	3	12			^a Includes— 1 major, chief of service. 1 captain, internist, 1 lieutenant, general medical.
7	First sergeant (585).....	1						1	1	
8	Technical sergeant, including.....							1	1	
9	Pharmacist (149).....				(1)			(1)	(1)	^b Includes— 1 major, chief of service. 1 captain, general surgeon.
10	Technician, grade 4.....							6	4	
11	Technician, grade 5.....							8	4	
12	Private, first class.....	7			20			5		
13	Private.....							8		
14	Chauffeur (344).....	(2)						(2)		^c Includes— 1 captain, chief of service. 1 lieutenant, oculist.
15	Chauffeur (345).....	(2)						(1)	(1)	
16	Clerk, general (055).....	(1)						(1)		
17	Clerk-typist (405).....	5	(1)					(1)	(1)	
18	Pharmacist (149).....	4			(1)			(1)	(1)	
19	Pharmacist (149).....	5			(1)			(1)		^d Dental.
20	Stenographer (213).....	4	(1)					(1)		^e Includes— 1 major, chief of service. 1 captain, assistant chief of service, oral surgeon.
21	Technician, dental (067).....	4			(2)			(2)	(1)	
22	Technician, dental (067).....	5			(2)			(2)	(1)	
23	Technician, laboratory (411).....	5			(1)			(1)	(1)	
24	Technician, medical (123).....	4			(1)			(1)	(1)	
25	Technician, medical (123).....	5			(2)			(2)	(1)	
26	Technician, medical (123).....				(3)			(3)		
27	Technician, surgical (225).....				(1)			(1)	(1)	
28	Technician, surgical (225).....	5			(1)			(1)		1 lieutenant, general operator.
29	Technician, surgical (225).....				(2)			(2)		
30	Basic (521).....				(3)			(3)		^f Medical Administrative Corps.
31	Total enlisted.....	8			21			29	10	The distribution of personnel indicated hereon is advisory; considerable variation therefrom is left to the discretion of the commanding officer of the dispensary.
32	Aggregate.....	10			31			41	10	The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.
33	Q Ambulance, ¾-ton.....	1						1		
34	Q Truck, ¾-ton.....	1						1		
35	Q Truck, ¾-ton, carry-all.....	2						2		

Plate 9. T/O 8-650, April 1, 1942. Organization of the General Dispensary Communications Zone.

Medical examining unit, aviation (T/O 8-141). These are usually authorized at the rate of one per army in the field. They are small units usually attached to the larger aviation centers where men are being trained or conditioned as fliers. Its principal function

is to determine whether personnel is physically fitted for flying and what particular type of flying an aviator is qualified or best suited.

Medical general laboratory (T/O 8-610). A medical general laboratory is established only in a theatre of operations when the latter is at a distance from the zone of the interior. Its functions include the standardization of technique and material for the laboratory service within the theatre of operations. Other activities are the production and standardization of diagnostic sera, standard chemical solutions, stains, biologicals, etc. Scientific investigation is another special function and this research is restricted to problems which offer in their solution a distinct contribution, directly or indirectly, toward the successful prosecution of military operations.

	1	2	3	4	5												
1	Unit	Special- ist's rat- ings(class)	P and W	Enlist- ed cadre	Remarks												
2	Major.....		a 1		• Flight surgeon. • Flight surgeon or ophthal- mologist-otolaryngologist. • May be flight surgeons. • Flight surgeon or neuro- psychiatrist.												
3	Captain.....		2 (•1) (•1)														
4	First lieutenant.....		• 3 (d 1)														
5	Total commissioned.....		6														
6	Staff sergeant.....		1	1	Summary of specialists' ratings:												
7	Sergeant.....		1														
8	Corporal.....		1														
9	Private, first class.....		4	1													
10	Private.....		7	1	<table><tr><th>Class</th><th>P and W</th></tr><tr><td>Third.....</td><td>1</td></tr><tr><td>Fourth.....</td><td>3</td></tr><tr><td>Fifth.....</td><td>3</td></tr><tr><td>Sixth.....</td><td>1</td></tr><tr><td>Total.....</td><td>8</td></tr></table>	Class	P and W	Third.....	1	Fourth.....	3	Fifth.....	3	Sixth.....	1	Total.....	8
Class	P and W																
Third.....	1																
Fourth.....	3																
Fifth.....	3																
Sixth.....	1																
Total.....	8																
11	Chauffeur (245).....		(1)														
12	Clerk (55).....	4th.....	(1)	(1)													
13	Clerk (55).....	5th.....	(1)														
14	Clerk (55).....	6th.....	(1)														
15	Motorcyclist (245).....		(1)														
16	Technician, laboratory (51).....	3d.....	(1)	(1)													
17	Typist (247).....	4th.....	(2)														
18	Typist (247).....	5th.....	(2)														
19	Basic.....		(1)														
20	Total enlisted.....		14	3													
21	Aggregate.....		20	3													
22	Q Car, light, 5-passenger sedan.....		1		The serial number symbol shown in parentheses for certain specialists is an inseparable part of the specialist designation. For qualification analysis, see corresponding serial number in section IV, MR 1-8 (old number 1-3).												
23	Q Motorcycle with side car.....		1														
24	Q Trucks, 1½-ton, cargo.....		2														

Plate 10. T/O 8-141, Aug. 1, 1939. Organization of the Medical Examining Unit, Aviation.

Medical laboratory, army or communications zone (T/O 8-611). (See Chapter IV.) The medical laboratory (army or communications zone) functions primarily as an epidemiological laboratory for the purpose of making such laboratory analyses, studies, and investigations as may be required in the control or prevention of disease. It may be utilized for diagnostic purposes where other laboratory facilities are lacking or inadequate. The communications zone laboratory usually operates under the immediate control of the communications zone surgeon, except when the communications zone is divided into sections. It may then be placed under the immediate control of a section surgeon.

Veterinary units. These comprise veterinary companies (separate) (T/O 8-99), veterinary evacuation hospitals (T/O 8-780), veterinary convalescent hospitals (T/O 8-790), veterinary general hospitals (T/O 8-750), and veterinary station hospitals (T/O 8-760).

The *veterinary company (separate)* is discussed under the "Army Veterinary Service" in Chapter IV because the army area is the usual area of operation for this unit.

The *veterinary evacuation hospital* (T/O 8-780) has a normal capacity of 150 animals with an emergency expansion to 300. These hospitals have transportation sufficient for their own movement. They are established at points which have advantages similar to

sites for evacuation hospitals for men, although they need not have direct rail-siding facilities. Veterinary evacuation hospitals receive animal casualties from the veterinary clearing stations of cavalry divisions and from veterinary aid stations of animal organizations not provided with veterinary troops. Evacuation of these casualties to the evacuation hospital from the division areas is accomplished by the veterinary company, separate. In general, evacuation hospitals for animals carry on the functions similar to those performed by evacuation hospitals for men. They should be established within one day's march for animal casualties from the division veterinary aid stations or veterinary clearing stations. All cases requiring further evacuation are sent to the veterinary general hospitals of the communications zone by stock train or by evacuation columns of led animals. When the veterinary evacuation hospital is operating in the army area, the army veterinarian makes the arrangements for the evacuation of animal casualties from the evacuation hospital in much the same manner as is done for the evacuation of men.

The *veterinary convalescent hospital* (T/O 8-790) (See Plate 12) has a normal capacity of 1000 animals. It furnishes a place for the reconditioning of worn-out or convalescent animals within the combat zone, thus avoiding the necessity of further evacuation for this purpose. It is usually located in the rear part of the army area and is not moved unless it is necessary to conform to major changes in the army area or the location of the veterinary evacuation hospitals. Army animals fit for duty are turned over to the army or corps remount depots.

The *veterinary general hospital* (T/O 8-750) has a normal capacity of 500 patients with facilities of expansion for 500 more. They are located centrally with reference to the veterinary evacuation hospitals from which animals will be received; that is, on or immediately off the main arteries of railway traffic leading from the combat zone. They may also be located to serve the needs of base remount depots or near similar animal concentrations.

The *veterinary station hospital* has a normal capacity of 150 patients. They are designed to meet local needs and are established in division training or rest areas, along main lines of communication where there are sufficient animals to justify their maintenance, and where it would not be in the interest of economy to utilize a veterinary general hospital. They function under local commanders.

Section Surgeons. In order to secure centralized control and decentralized operation of supply and administration, the communications zone may be subdivided from front to rear into three parts: an *advance section*, an *intermediate section*, and a *base section*. The communications zone will not be organized in the same manner in each theatre of operations. Its organization must be adapted to the plan of operation and be based on a careful study of the actual conditions in the theatre of operations. When the depth of the zone is considerable, there is normally an advance section. If the communications zone is very extensive, an intermediate section may be established between the base and advance sections. The extent of this subdivision is determined by the location of centers of commerce and population, the location and direction of the principal lines of communications, and the number of activities and total personnel that can be supervised by one staff. Section surgeons are assigned accordingly.

The office of the surgeon of a section. The office of the surgeon of a base or other section is organized in a manner similar to that of the office of the surgeon of the communications zone, although on a smaller scale. The surgeon must so organize his office as to be free to circulate among the various and dispersed activities within the section as he exercises supervisory control over various Medical Department activities which are under the control of the commanding general of the section. The functions of the latter are principally those of an area commander; he exercises no authority over general supply establishments. Medical activities usually include *station hospitals*, *general dispensaries*, *medical laboratories*, *veterinary establishments*, and *sanitation of the area*.

The Surgeon of an Embarkation-Debarcation Camp. The surgeon of an embarkation-debarcation camp bears the same relationship to the commanding officer of the camp as the surgeon to the commanding officer of a garrison. He has additional responsibilities

	1	2	3	4	5	6	7	8
	Unit	Specialists' ratings (class)	Headquarters	Operating and clearing section ^a	Hospital section ^b	Total	Enlisted cadre	Remarks
2	Lieutenant colonel.....		1			1		
3	Major.....		1	1		1		
4	Captain.....		1	1	2	4		
5	Lieutenant.....		1		3	4		
6	Total commissioned.....		3	2	5	10		^a May be divided into receiving, evacuation, and operating wards. ^b May be divided into surgical, medical, and contagious wards. ^c Medical Corps.
7	Master sergeant, including.....		1			1	1	
8	Sergeant major (052).....		(1)			(1)	(1)	
9								
10	First sergeant (585).....		(1)			(1)	(1)	
11	Staff sergeant, including.....		1	1	1	3	1	
12	Section leader (652).....			(1)	(1)	(2)		
13	Supply (185).....		(1)			(1)	(1)	
14	Sergeant, including.....		3	3	3	9	3	
15	Forage inspector (085).....		(1)			(1)	(1)	
16	Mess (124).....		(1)			(1)	(1)	
17	Technician, medical (123).....		(1)			(1)	(1)	
18	Wardmaster (793).....			(3)	(3)	(6)		
19	Corporal, including.....		1	4	7	12	1	
20	Assistant wardmaster (793).....			(3)	(7)	(10)		
21	Clerk (055).....		(1)	(1)		(2)	(1)	
22	Private, first class.....					(75)		
23	Private.....		33	79	115	{ 152 }	11	
24	Bugler (021).....		(2)			(2)		
25	Carpenter, general (050).....	5th	(1)			(1)		
26	Chauffeur (245).....	5th	(3)			(3)		
27	Chauffeur (245).....	6th	(3)			(3)		
28	Clerk, general (055).....	6th		(1)		(1)		
29	Clerk personnel (055).....	5th	(1)			(1)		
30	Clerk, receiving & shipping (180).....	5th	(1)			(1)		
31	Cook (060).....	3d	(3)			(3)	(1)	
32	Cook (060).....	4th	(3)			(3)	(1)	
33	Cook's helper (521).....	4th	(4)			(4)		
34	Forage inspector (085).....	4th	(1)			(1)	(1)	
35	Horseshoer (094).....	3d		(2)		(2)		
36	Horseshoer (094).....	4th		(4)		(4)		
37	Horseshoer, clinical (094).....	3d		(2)		(2)	(1)	
38	Mechanic, automobile (014).....	3d				(1)		
39	Motorcyclist (678).....	6th	(1)			(1)		
40	Orderly (605).....		(1)	(1)	(1)	(3)		
41	Orderly, stable (637).....			(10)	(60)	(70)		
42	Orderly, ward (696).....			(9)	(18)	(27)		
43	Pharmacist, veterinary (150).....	3d		(2)		(2)	(1)	
44	Saddle and harness maker (192).....	4th	(1)			(1)		
45	Stenographer (213).....	3d	(1)			(1)		
46	Teamster (235).....	5th			(1)	(1)		
47	Teamster (235).....	6th			(2)	(2)		
48	Technician, laboratory (051).....	4th		(2)		(2)	(1)	
49	Technician, laboratory (051).....	6th		(2)		(2)		
50	Technician, medical (123).....	4th	(1)			(1)	(1)	
51	Technician, sanitary (196).....	4th	(1)			(2)	(1)	
52	Technician, sanitary (196).....	6th	(1)			(2)		
53	Technician, surgical (225).....	3d	(1)			(1)	(1)	
54	Technician, surgical, veterinary (226).....	2d		(1)		(1)	(1)	
55	Technician, surgical, veterinary (226).....	3d		(1)	(1)	(2)		
56	Technician, surgical, veterinary (226).....	4th		(3)	(1)	(4)		
57	Technician, surgical, veterinary (226).....	5th		(4)	(2)	(6)		
58	Technician, surgical, veterinary (226).....	6th		(5)	(4)	(12)		
59	Technician, veterinary (250).....	4th		(2)	(2)	(4)	(1)	
60	Technician, veterinary (250).....	5th		(5)	(4)	(10)		
61	Technician, veterinary (250).....	6th		(10)	(4)	(14)		
62	Typist (247).....	4th		(1)		(1)		
63	Basic (521).....			(8)	(15)	(23)		
64	Total enlisted.....		40	87	120	253	18	
65	Aggregate.....		43	89	131	263	18	
66	Q Car, light, 5-passenger sedan.....		1			1		
67	Q Motorcycle, with side car.....		1			1		
68	Q Mule, draft.....				12	12		
69	Q Truck, 1½-ton, cargo.....		2			2		
70	Q Truck, 2½-ton, cargo.....		3			3		
71	Q Wagon, escort.....				3	3		

^a May be divided into receiving, evacuation, and operating wards.
^b May be divided into surgical, medical, and contagious wards.
^c Medical Corps.

Summary of specialists' ratings

Class	Number
2d.....	1
3d.....	14
4th.....	23
5th.....	24
6th.....	37
Total.....	99

The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in section I, AR 615-28. A number above 500 refers to a military occupational specialist listed in section II, AR 615-24.

Plate 12. T/O 8-237, Nov. 1, 1940. Organization of the Veterinary Convalescent Hospital.

imposed by the arrival and departure of troops and casualties. Embarkation and debarkation camps for large expeditionary forces will usually consist of one or more large concentration camps or centers conveniently located to base ports. The office of the surgeon of such a camp is organized as related below. The organization herein does not contemplate that the surgeon be also surgeon of the port proper. If such is the case, additional sections of the office are necessary.

Administration section. This section coordinates the duties of the office and receives records and distributes mail.

Hospitalization section. This section has general supervision over the care and hospitalization of all sick and wounded passing through the camp, both to and from the zone of the interior. Hospitalization and care of sick and wounded may be extensive, especially if large numbers of troops and casualties are moving.

Receiving and forwarding section. This section receives the sick and wounded for return to the zone of the interior and inspects troops received from or returning to that zone. The section may be subdivided as follows:

The *receiving subsection* arranges for the examination of troops or sick passing through the port and disposes of those found disabled. The latter are usually sent to the hospitals of the camp.

The *forwarding subsection* arranges for the transportation of the disabled to the zone of the interior.

The *physical examination subsection* conducts the physical examination of troops. By examining those received from the zone of the interior, diseases that may be a menace to the field forces may be detected. Homeward-bound troops are also examined to detect diseases that may be a menace to the homeland. Examining teams also conduct the medical supervision of bathing and delousing establishments through which all homeward-bound troops, and on occasions those arriving from the zone of the interior, must pass.

Teams are designated to meet every train filled with sick and wounded to be embarked to examine all cases that give evidence of lack of condition for further travel, and to render any medical assistance in case of sudden sickness or injury among troops arriving or departing. The personnel of these teams is also assigned to accompany troop trains for the purpose of medical attendance.

Liaison (with overseas transport) subsection keeps the office informed as to the arrival and departure of vessels pertaining to the expeditionary force. These may be operated by the navy, army transport service, or other agency.

Sanitation section. The functions of the sanitation section consist, generally, of supervising the sanitation of the camp and the execution of measures for the control of communicable diseases. The nature and functions of these embarkation-debarkation camps are such that special attention must be devoted to the prevention of epidemics, particularly of respiratory diseases. Because of these conditions, the sanitation section is especially concerned with the supervision of the physical inspections of troops and the sanitation of housing facilities.

Supply section. The supply section supervises the medical supply activities of the camp.

The Surgeon, Army Group. Two or more armies may be organized into a group of armies under a designated commander. The surgeon of an army group is the advisor of the group commander upon medical matters relating to the group. He is a coordinator of medical activities between the armies and general headquarters. He forwards important communications upon medical subjects from the surgeons of the armies to the chief surgeon of the forces, but beyond this does not conduct an office of transmittal. He maintains no office of record, beyond keeping a file of communications of immediate interest.

The Surgeon, Army. The surgeon's office, or headquarters, army medical service, is organized into sections concerned with the control of the activities of the medical service within the army. These sections are: *administrative, hospitalization, supply, evacuation, sanitation, consultant, dental, and veterinary.* (See Chapter IV.)

The Surgeon, Corps. As the administrative functions of corps headquarters are limited

the surgeon's office has only four sections, *administrative, consultant, dental, and veterinary* (See Chapter IV.)

The Division Surgeon. From a tactical and administrative viewpoint, the infantry division is the basic organization of an army. It comprises in its organization the essential combat and administrative branches, all in correct proportion and so organized as to make it tactically and administratively a self-sustained unit. The division is the combat and tactical maneuvering unit of the combined arms. Its role in battle is the execution of tactical missions vital to the combat success of the corps.

See Chapter III for the organization of the division surgeon's office.

HOSPITALIZATION AND EVACUATION

Definitions. *Military hospitalization* may be defined as the process of providing shelter, care and other environmental factors needed to restore the disabled to health and physical fitness.

Evacuation of the sick and wounded may be defined as the withdrawal of casualties to a place where proper care and treatment may be given.

Hospitalization and evacuation of the sick and wounded are co-related subjects. When either is discussed, the other must be considered. It may be said that military hospitalization is but a phase of evacuation. It may be said in turn that evacuation is a phase of hospitalization. The evacuation of advanced units is influenced by hospitalization facilities in the rear. As the distance from the front increases, the necessity for evacuation decreases and hospitalization becomes more fixed.

Hospitalization, in a broad sense, refers particularly to fixed as distinguished from mobile hospitalization. It embodies not only shelter from the elements but all other appurtenances in the way of bedding, food, clothing, heat, light, nursing, treatment by surgical and medical specialists, X-ray and laboratory facilities, and opportunity for convalescence and recreation. Hospital "beds" is a numerical term referring to hospital capacity.

Hospital Allowances. Hospital allowances for a theatre of operations are expressed in terms of total "*fixed beds*" to be provided and not in terms of units. Only those beds established in fixed hospital units designed to give definite treatment are considered. The total number of beds provided for a theatre of operations may not necessarily be located within the theatre. If the theatre of operations adjoins the zone of the interior, with only a shallow communications zone, the majority of fixed beds for the casualties of the theatre may lie within the zone of the interior. The farther the theatre of operations is removed from the zone of the interior, the greater the proportion of beds that must be authorized for establishment within the communications zone. The number of beds to be thus established also depends on many other factors, among them being the nature and extent of combat, the shelter and other facilities within the theatre, the resistance of the enemy, and conditions which may influence health among troops. In determining the policy of evacuation and the number of beds to be provided, these variables should be analyzed. It is important that the allowances be fixed in each specific war plan in order to assure an equal and balanced flow of units to the theatre of operations sufficient to meet hospitalization requirements at all times. Such allowances are generally fixed on a sliding scale, i.e., the percentage of beds increases as a war develops or becomes prolonged. During the period of mobilization, before combat begins, beds are necessary for the sick only. When combat begins, additional beds must be available for the wounded. As many of the wounded require prolonged treatment, they accumulate in hospitals, making necessary a still larger proportion of beds. The percentage of beds required gradually increase in proportion to the severity and intensity of combat. Since many cases requiring long treatment eventually recover, the percentage of beds required gradually becomes more constant.

Average bed allowance. It should be realized that each condition cited represents a different situation. The number of treatment beds to be provided for a given theatre and the time they should be available will vary. The policy of evacuation must be decided; on this depends the proportion of treatment beds that are to be provided in the theatre of

operations. The most constant factor will usually be the number of beds that must be provided for the casual sick, that is, 5 beds for every 100 men.

Sick rates. Taking all factors into consideration and allowing a slight increase of the admittance rate (1.4 per M to 1.5 per M) to cover normal seasonal and other variations above the average, treatment beds for sick alone under usual conditions may be estimated as follows:

Daily admittance rate per M		Average days in hospital		Beds required per M
1.5	X	27.29	=	40.9 or 4.09 per cent

Additional beds should be allowed for dispersion of patients, making this figure approximately 5 per cent.

Battle wounds require longer treatment than sick casualties. The average stay in hospital of the sick and wounded increase with the proportion of the latter. The average duration of treatment during the world war was 48.6 days. The average treatment beds required at the end of a year for a force of constant size under such conditions may be estimated as follows:

$$2.65 \times 48.6 = 128.8 \text{ per M. or } 12.88 \text{ per cent.}$$

Additional beds should be allowed for dispersion of patients, increasing this figure to 14 per cent.

With such battle losses as occurred during the severe combat of the Meuse-Argonne offensive (September 26 to November 11, 1918), the daily admittance rate to treatment beds for both sick and wounded was increased to 3.2 per thousand of the total strength of the A.E.F. Under such conditions, the ultimate number of beds required may be estimated as follows:

Kind of cases	Daily rate of admission		Average days per case		Ultimate No. in hospital
Disease and non-battle injuries ..	1.65	X	27.29	=	45.03
Gas injuries .....	.45	X	41.77	=	18.79
Gunshot injuries	1.10	X	94.84	=	104.32
Total per 1000 strength					168.14

The rate of 168.14 per thousand will be the actual number of patients in hospital. If 10 per cent is added for the dispersion of patients the number of beds required would be 184.96 per thousand strength or 18.50 per cent of the total strength.

Of all casualties inflicted by gunshot and gas, excluding the killed:

65 percent returned to duty in the theatre of operations within 90 days. (33 per cent recovered within 30 days; and 32 per cent recovered within the following 60 days).

6 per cent died in hospitals.

9 per cent were evacuated to the U. S.

20 per cent remained in hospitals in France after 90 days.

Of all battle casualties, excluding the killed, 21 per cent were a permanent loss as a military asset.

In smaller forces and over shorter periods of time, there will be a wider variation in the averages rates as given above.

Buildings for Hospitalization (Hospital Program). Some of the units destined to establish fixed hospitalization in the communications zone will usually be able to utilize existing shelter in permanent buildings. Accommodations for the remaining units must be provided by new construction. It may be accepted as based on experience that authorized construction will not become available for occupancy before the lapse of six months following authorization. Therefore, new construction for hospitals must be inaugurated in advance of the arrival of the troops for which intended. The Medical Department, if it is to keep its hospitalization program abreast of the needs, must be given authority to provide in advance, by construction or otherwise, the hospitals necessary to cover this delay in construction and to meet expected requirements. The program must anticipate the expected demand and by timely action insure that it is met. The chief surgeon of the

field force keeps in his office a balance sheet of the hospitalization program showing, in one column, the total bed requirements estimated, and, in the other column, the number of beds actually established, plus the number of beds in process of establishment in suitable buildings or to be provided by new construction.

Hospitals in the Theatre of Operations. Medical units provided in the theatre of operations for the hospitalization of armies in the theatre comprise mobile and fixed hospitals.

Mobile hospitals. Mobile hospitals accompanying the armies in the combat zone are equipped with sufficient tentage for sheltering patients; but, as a rule, advantage is taken of any opportunity to occupy and utilize existing buildings. These units comprise *clearing companies, surgical hospitals, evacuation hospitals, and convalescent hospitals*. The beds provided by them are not included in the term "bed" or "hospitalization allowances" for a theatre of operations. Only in specific instances, where they are to be converted to use as fixed hospitals, are they so classed.

Fixed hospitals. Fixed hospitals are the installations in the communications zone to which the sick and wounded are sent for definite treatment. They comprise *general hospitals, station hospitals, hospital centers, and convalescent camps*.

Hospital Units of the Communications Zone. *General hospital* (T/O 8-550). (See Plate 13.) The personnel of the general hospital unit is divided into two general groups, the administrative services and the professional services. The professional services constitute about four-fifths of the personnel of a unit. The personnel, when properly organized and trained, can operate efficiently a hospital of 1000 beds. General hospitals of the communications zone are standard establishments with a normal capacity of 1000 patients, but they may be expanded in an emergency to care for more than that number. Two thousand should be the limit of expansion and then only temporarily in extreme emergency. These establishments are equipped to give definite medical and surgical treatment to all cases, but they do not necessarily do so. When once located, a general hospital usually remains in that place throughout the period of operations.

Hospital center (T/O 8-540). (See Plate 14.) General hospitals are often grouped to form a hospital center. The unit consists of a *headquarters and service company, a center laboratory, a convalescent camp*, and the number of *general hospital units* assigned to the group. The center is commanded by a brigadier general, Medical Department. Each hospital center will require laundry, motor transport, bakery, and other quartermaster facilities and military police, finance, postal, and signal corps detachments. The amount of this additional personnel depends upon the size of the center. The total patient capacity of a center is dependent on the number of general hospitals assigned to it. A center with 3 general hospitals and 1 convalescent camp will have a normal capacity of 4000 beds. A center of 10 general hospitals will have a maximum capacity of 22,000 beds; this capacity includes crisis expansion.

Hospital centers are particularly advantageous in large field forces as they permit economy in Medical Department personnel, simplify supply and evacuation problems, and facilitate administration. Grouping permits specialization of hospital units and provides better treatment for patients, as the latter may be distributed directly from hospital trains to those hospitals best fitted for the treatment of particular types of cases.

Hospital centers are not advantageous unless three or more general hospitals are grouped therein. The administrative overhead required is considerable, and economy in personnel does not result if a smaller number of general hospitals are grouped. Considerable time is required for the necessary construction. Hospital centers usually require new construction as existing buildings are not often available or adaptable to such large institutions.

Convalescent camps are located in the vicinity of and as a part of hospital centers. Their function is to relieve the general hospitals of the necessity for caring for patients who no longer need hospital treatment but who are not yet fit for duty and to restore to physical fitness such convalescents. The type camp has a capacity of 1000, although in actual practice it is equipped to accommodate 20 per cent of the total capacity of the center to which it belongs.

Station hospitals (T/O 8-560). (See Plate 15.) The personnel of this hospital unit

is divided into two services, administrative and professional. Station hospitals for the theatre of operations are establishments of the communications zone, having a normal capacity of 150 beds. They render general medical and surgical treatment for those areas where there are sufficient military populations to justify their maintenance but not sufficient to justify general hospitals.

Geographical Distribution of Fixed Hospitalization (Beds). The railway net in a

1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
			Administrative service							Professional service								
		Technician grade	Headquarters	Regiment, receiving and patients' detachment, medical department	Medical supply	Mess	General supply and utility	Medical	Surgical	Dental	Laboratory	Röntgenological	Total	Enlisted cadre	Remarks			
1	Unit																	
2	Colonel		1										1			a Executive officer.		
3	Lieutenant colonel															b Chief of medical service.		
4	Major															c Chief of surgical service.		
5	Captain															d Dental.		
6	First lieutenant															e Chief of laboratory service, qualified in clinical and laboratory procedure.		
7	Second lieutenant															f X-ray therapist.		
8	Total commissioned		6	3	2	1	1	2	14	17	5	5	2	56		g Quartermaster.		
9	Warrant officer		1											1		h Medical Administrative Corps.		
10	Nurse		5							100				105		i Chaplain.		
11	Master sergeant, including			3										3	2	j Recruiting and evaluation officer.		
12	Clerk, chief (502)			(2)										(2)	(1)	k Sanitary Corps.		
13	Sergeant major (502)			(1)										(1)	(1)	l Biochemist.		
14	First sergeant (548)			1										1		m May be exchange officer.		
15	Technical sergeant, including			4										4	7	n The medical service includes the following sections with a qualified major in charge of each section:		
16	Clerk, chief (502)			(2)										(2)	(1)	o Gastro-enterology section.		
17	Male nurse (225)														(1)	p Neuropsychiatric section.		
18	Mess, hospital (324)			(1)										(1)	(1)	q General medical section.		
19	Pharmacist (149)														(1)	r Cardio-vascular section.		
20	Supply (325)			(1)										(1)	(1)	s Communicable diseases section.		
21	Staff sergeant, including			12										12	18	t The surgical service includes the following sections with a qualified major in charge of each section:		
22	Clerk, chief (502)			(3)										(3)	(2)	u Orthopedic section.		
23	Clerk, general (555)			(3)										(3)	(1)	v Urologic section.		
24	Mess (324)			(1)										(1)	(1)	w Eye, ear, nose, and throat section.		
25	Motor (813)			(1)										(1)	(1)	x Septic surgery section.		
26	Supply (321)			7										7	12	y General surgery section.		
27	Sergeant, including			14										14	22	z 1 officer trained in anesthesia.		
28	Duty (566)			(3)										(3)	(2)	aa The dental service includes—		
29	Clerk, chief (502)			(2)										(2)		ab 1 lieutenant colonel, chief of dental service.		
30	Clerk, general (555)			(3)										(3)		ac 2 captains, oral surgeons.		
31	Mess (324)			(3)										(3)	(1)	ad 1 captain, prosthetist.		
32	Motor (813)			(1)										(1)		ae 1 first lieutenant, general physician.		
33	Supply (322)			(2)										(2)	(10)	af The laboratory service includes—		
34	Corporal, including			8						17				25		ag 1 clinical laboratory section.		
35	Duty (566)			(5)						(5)				(5)	(10)	ah 1 bacteriology and serology section.		
36	Motor (813)			(1)										(1)	(2)	ai 1 biochemical section.		
37	Supply (321)			(2)										(2)		aj Chief clerk.		
38	Ward (738)			(12)										(12)	15	ak Nurses—		
39	Technician, grade 3			15										15	33	al 1 chief nurse.		
40	Technician, grade 4			25										25	43	ao 1 assistant (medical).		
41	Technician, grade 5, including			36										36	97	ap 1 assistant (surgical).		
42	Private, first class			47										47	144	aq 1 assistant (operating room).		
43	Private			79										79		ar 1 assistant (night nurse).		
44	Baker (017)	5		(1)												as 3 qualified in preparation of special diet.		
45	Baker (017)			(1)												at Veterinary.		
46	Barber (022)	4		(1)												au The officer and nurse personnel in this table is considered the basic requirement in personnel. Officer specialists and nurses should be requisitioned when the volume or nature of the work warrants.		
47	Barber (022)			(1)												av In addition to military personnel listed hereon the services of the following may be required:		
48	Bugler (303)			(1)												aw 1 head dietitian.		
49	Butcher (037)	5		(1)												ax 2 dietitians.		
50	Butcher (037)			(1)												ay 1 head physical therapy aides.		
51	Carpenter (050)	5		(1)												az 2 physical therapy aides.		
52	Carpenter (050)			(2)												ba 2 seamstresses.		
53	Chaplain's assistant (534)	5		(2)												bb 2 dental hygienists.		
54	Chauffeur (345)	8		(2)												bc The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 300 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 300 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1932.		
55	Chauffeur (345)			(2)														
56	Clerk, general (555)	4		(1)														
57	Clerk, general (555)			(1)														
58	Clerk, general (555)			(1)														
59	Clerk, mail (556)	5		(1)														
60	Clerk, mail (556)			(1)														
61	Clerk, stock (324)	4		(1)														
62	Clerk, stock (324)			(1)														
63	Clerk, stock (324)	5		(1)														
64	Clerk-typist (405)	4		(1)														
65	Clerk-typist (405)			(1)														
66	Clerk-typist (405)	5		(1)														
67	Cook (060)	4		(1)														
68	Cook (060)			(1)														
69	Cook's helper (521)	5		(17)											(3)			
70	Meat and dairy hygienist (520)	4		(23)											(23)			
71	Mechanic, automobile (014)	4		(1)											(1)			
72	Mechanic, automobile (014)			(1)											(1)			
73	Mechanic, orthopedic (586)	4		(1)											(1)			
74	Operator, electric plant (077)	6		(1)											(1)			

Plate 13. T/O 8-550, April 1, 1942. Organization of the General Hospital, Communications Zone.

theatre of operations is an important factor to consider both as to the organization of the theatre and the conduct of military operations. It is particularly true regarding the medical service. The arrangement of the transportation lines controls not only the location of the evacuation hospitals in the combat zone but also the location of the general hospitals of the communications zone. The latter are located with relation to the main lines of railway traffic. Keeping in close touch with existing and prospective military

operations, particularly with reference to sectors where the maximum effort is to be made, the chief surgeon of the field force should recommend the distribution of general hospitals along railway lines radiating from regulating stations. In all contemplated military operations tentative locations for regulating stations should be selected as far in advance as possible. These are essential data, and only when the surgeon has them at hand can he recommend intelligently and develop an adequate hospitalization program. General hospitals must also be located with regard to their safety, that is, removed from the combat area a sufficient distance so that a military reverse may not disturb their functioning. The important things to bear in mind as to location of fixed hospitals are:

The principles governing the geographical distribution of hospitals.

That the hospitalization project must meet the conditions pertinent to the particular theatre of operations considered.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Unit	Technician grade	Administrative service						Professional service					Total	Enlisted cadre	Remarks
		Headquarters	Registrar, receiving and patients' detachment	Detachment, medical department	Medical supply	Mess	General supply and utility	Medical	Surgical	Dental	Laboratory	Roentgenological			
Private—Continued			(18)						(30)				(18)		
75	Orderly (665)												(50)		
76	Orderly, hospital (303)												(2)		
77	Painter, general (144)		(2)										(1)	(1)	
78	Pharmacist (149)	3											(2)	(1)	
79	Pharmacist (149)	4											(2)	(1)	
80	Pharmacist (149)	5											(2)	(2)	
81	Plumber (164)		(2)										(2)		
82	Repairman, utility (121)		(2)										(2)		
83	Stenographer (213)	4	(2)										(3)	(1)	
84	Stenographer (213)	5	(3)										(4)		
85	Tailor (244)														
86	Technician, dental (067)	3											(2)		
87	Technician, dental (067)	4											(3)		
88	Technician, dental (067)	5											(6)		
89	Technician, laboratory (411)	3											(2)	(1)	
90	Technician, laboratory (411)	4											(4)		
91	Technician, laboratory (411)	5											(5)		
92	Technician, laboratory (411)												(3)		
93	Technician, medical (123)	4											(14)	(1)	
94	Technician, medical (123)	5											(21)		
95	Technician, medical (123)												(49)		
96	Technician, sanitary (198)	5	(1)										(1)		
97	Technician, sanitary (198)		(8)										(9)		
98	Technician, surgical (225)	3											(9)	(1)	
99	Technician, surgical (225)	4											(9)	(1)	
100	Technician, surgical (225)	5											(18)		
101	Technician, surgical (225)												(18)		
102	Technician, X-ray (264)	4											(3)	(1)	
103	Technician, X-ray (264)	5											(3)	(1)	
104	Technician, X-ray (264)												(2)		
105	Technician, X-ray, dental (264)	3											(1)		
106	Basic (521)		(31)										(31)		
107	Total enlisted		230							270			500	30	
108	Aggregate		251							411			662	30	
109	Q Ambulance, $\frac{1}{2}$ -ton						8							8	
110	Q Truck, $\frac{1}{2}$ -ton						2							2	
111	Q Truck, $\frac{1}{2}$ -ton, carry-all						4							4	
112	Q Truck, $\frac{1}{2}$ -ton, cargo						4							4	
113	Q Truck, $\frac{1}{2}$ -ton, dump						1							1	
114	Q Truck, $\frac{1}{2}$ -ton, cargo						3							3	

Plate 13. T/O 8-550, April 1, 1942. Organization of the General Hospital, Communications Zone (Continued).

Temporary needs. Occasional provision must also be made for immediate local requirements in the case of troops being sent into territory where no established hospitalization exists. The chief surgeon must be informed of any contemplated movements of this nature in order that steps may be taken in advance to provide proper hospitalization for such detached forces. If the new area to be taken over is to be permanently occupied, fixed hospitals must be provided; if for temporary occupancy, mobile organizations, such as evacuation hospitals, may accompany the troops and provide for their temporary needs.

Tactical coordination. The chief surgeon of a field force, having in mind a comprehensive estimate of the problem with which he is confronted, cannot act independently in making recommendations for the location of hospitals. This feature has a strategic application. The chief surgeon must be admitted to the council of the high command and kept familiar with the details of contemplated operations. Only by knowing these details in advance can he be expected to establish adequate, fixed hospitalization.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Unit	Technician grade	Headquarters and band	General head-quarters section	Personnel section	Company head-quarters section	Evacuation and receiving section	Sanitation section	Medical supply section	Center laboratory	Convalescent camp ^a	Attached chaplain	Total (exclusive of general hospital) ^b	Enlisted cadre	Remarks
Brigadier general.....		1										1		
Colonel.....		(a1) 5							1	1		7		
Lieutenant colonel.....										(d1) 2		6		
Major.....		(b1) 2								(d2)	1	10		
Captain.....										(d3)		4		
Lieutenant.....										(d4)				
Total commissioned.....		9							3	11	1	29		
Warrant officer.....		1	1	1										
Nurse.....		11										4		
Master sergeant, including.....			1											
Sergeant major (502).....			(1)							1		2	1	
First sergeant (585).....										(1)		(2)	(1)	
Technical sergeant, including.....										4		5		
Bandsmen (020).....		1	1	1	1	1		1	1	1		7		
Clerk, chief (502).....		(1)	(1)	(1)	(1)	(1)								
Clerk (824).....														
Supply (325).....								(1)	(1)	(1)		(1)		
Technician, laboratory (411).....												(1)		
Staff sergeant, including.....		1	2	2	3	3		1		1		13	2	
Bandsmen (021).....		(1)	(2)	(2)	(1)	(3)		(1)	(1)	(1)		(1)	(1)	
Clerk, record (055).....												(1)		
Mess (824).....														
Motor (813).....														
Sergeant, including.....										2		3	2	
Mess (824).....										(1)		(1)	(1)	
Supply (821).....										(1)		(2)	(1)	
Corporal, including.....										8		8		
Section leader (652).....								(8)						
Technician, grade 3.....		26	23	12	22	11	7	10	14	92		50	8	
Technician, grade 4.....												56	8	
Technician, grade 5.....												49		
Private, first class.....												61		
Private.....														
Bandsmen (021).....	4	(7)												
Bandsmen (021).....	5	(8)												
Bandsmen (021).....		(11)												
Eugler (845).....														
Carpenter (050).....						(3)								
Chaplain's assistant (534).....	5		(1)							(1)				

^a Normal patient capacity, 1,000.^b Personnel in this table is the basic requirement. The commanding general of the center may call on the general hospitals for personnel required to supplement certain center facilities. These center facilities will decrease the personnel requirement in the general hospitals.

Centralization of receiving, evacuation, medical supply, general supply, utilities, sanitation, transportation, laboratory, and guard will reduce the requirements of personnel for similar duties in the general hospitals assigned to the center.

The total patient capacity of the center is dependent on the number of general hospitals and convalescent camps assigned to the center.

Each hospital center will require laundry, motor, transport, baking, and other quartermaster personnel, also military police, finance, postal, and Signal Corps detachments. The amount of this additional personnel depends upon the size of the center and whether the centers are to be located in the zone of the interior or the communications zone.

Executive officer.

Dental.

Includes—

- 1 medical inspector.
- 1 medical service, coordinator.
- 1 surgical service, coordinator.
- 1 dental service, coordinator.
- 1 laboratory service, coordinator.

- † Center receiving and evacuation officer.
- ‡ Biochemist, Medical or Sanitary

41	Chauffeur (344)	5	(2)	(1)	(1)	(1)	(2)	(1)	(1)	(4)			
42	Chauffeur (345)	5	(4)	(1)	(3)	(5)	(1)	(7)	(22)				
43	Clerk, general (055)	4	(1)	(1)	(1)	(1)	(1)	(1)	(5)				
44	Clerk, general (055)	5	(1)	(1)	(1)	(1)	(1)	(1)	(7)				
45	Clerk, general (055)	4	(1)	(1)	(1)	(1)	(1)	(1)	(5)				
46	Clerk, record (055)	4	(2)	(1)	(1)	(1)	(1)	(1)	(15)				
47	Clerk, stock (324)	4	(1)	(1)	(1)	(1)	(1)	(1)	(2)				
48	Clerk, stock (324)	5	(1)	(1)	(1)	(1)	(1)	(1)	(3)				
49	Cook (060)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
50	Cook (060)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
51	Cook's helper (521)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
52	Meat and dairy hygienist (120)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
53	Mechanic, automobile (014)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
54	Orderly (695)	5	(4)	(1)	(3)	(1)	(1)	(1)	(1)				
55	Pharmacist (149)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
56	Pharmacist (149)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
57	Repairman, utility (121)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
58	Stenographer (213)	5	(2)	(1)	(1)	(1)	(1)	(1)	(1)				
59	Stenographer (213)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
60	Technician, dental (067)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
61	Technician, dental (067)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
62	Technician, laboratory (411)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
63	Technician, laboratory (411)	3	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
64	Technician, laboratory (411)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
65	Technician, laboratory (411)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
66	Technician, laboratory (411)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
67	Technician, medical (123)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
68	Technician, medical (123)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
69	Technician, medical (123)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
70	Technician, medical (123)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
71	Technician, sanitary (196)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
72	Technician, sanitary (196)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
73	Technician, surgical (225)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
74	Technician, surgical (225)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)				
75	Technician, surgical (225)	4	(2)	(1)	(1)	(1)	(1)	(1)	(1)				
76	Typist (247)	5	(2)	(1)	(1)	(1)	(1)	(1)	(1)				
77	Typist (247)	4	(2)	(1)	(1)	(1)	(1)	(1)	(1)				
78	Basic (521)	5	(3)	(1)	(1)	(1)	(1)	(1)	(23)				
79	Total enlisted	28	27	15	27	15	7	12	15	109	255	22	
80	Aggregate	39	28	16	28	17	8	14	18	120	1	289	22
81	Ambulance, $\frac{3}{4}$ -ton	4	4	5	2	1	1	1	1	2	5	9	5
82	Truck, $\frac{3}{4}$ -ton, carry-all	2	2	1	1	1	1	1	1	1	1	4	4
83	Truck, $\frac{3}{4}$ -ton, weapon carrier	3	3	1	1	1	1	1	1	1	1	6	6
84	Truck, $\frac{3}{4}$ -ton, cargo	3	3	1	1	1	1	1	1	1	1	6	6

Corps.

Adjutant.

May be Medical Administrative Corps.

Band leader.

Chief clerk.

Principal chief nurse of center.

Veterinary.

The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-28. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.

Plate 14. T/O 8-540, April 1, 1942. Organization of the Hospital Center.

Corps.
 a Adjutant.
 i May be Medical Administrative Corps.
 j Band leader.
 k Chief clerk.
 l Principal chief nurse of center.
 m Veterinary.
 The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in A.R. 615-24. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.

[illegible]

100	Technician, surgical	(2)	(3)	(5)	(8)	(10)	(11)	(13)	(15)	(16)	(20)	(24)	(25)	(26)	(33)	(34)
101	Technician, X-ray (254)	4	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)	(2)	(1)
102	Technician, X-ray (264)	5	(1)	(1)	(1)	(1)	(2)	(1)	(2)	(2)	(2)	(3)	(3)	(3)	(3)	(1)
103	Technician, X-ray (264)	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)	(2)	(1)
104	Basic (521)	(1)	(4)	(5)	(6)	(10)	(12)	(13)	(25)	(27)	(32)	(37)	(39)	(41)	(45)	(1)
105	Total enlisted	25	41	62	97	125	150	175	251	275	328	371	392	415	459	28
106	Aggregate	34	54	85	125	161	201	233	331	364	426	480	508	539	596	28
107	Q Ambulance, ¼-ton	2	2	2	3	3	3	3	4	6	6	5	6	6	6	25
108	Q Car, 5-passenger, light sedan	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25
109	Q Truck, ¼-ton	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25
110	Q Truck, ¾-ton, weapon	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25
111	Q Truck, 1½-ton, cargo	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25
112	Q Truck, 2½-ton, cargo	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25
113	Q Truck, 2½-ton, dump	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25

COLUMN 24-REMARKS

†Insert number of hospital.
 * 1 Medical Administrative Corps.
 * 1 Corps of Chaplains.
 * 2 Medical Administrative Corps.
 * 3 Medical Administrative Corps.
 * 4 Medical Administrative Corps.
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 * 97 Medical Administrative Corps.
 * 98 Medical Administrative Corps.
 * 99 Medical Administrative Corps.
 * 100 Medical Administrative Corps.

In addition to military personnel listed hereon, services of the following civilians are required in the larger station hospitals.

Plate 15. T/O 8-560, July 22, 1942. Organization of the Station Hospital, Communications Zone. (Continued)

Red Cross personnel

Red Cross aides may be assigned to hospitals prior to movements to a theater, in accordance with assignment schedule agreed upon by the War Department and the American Red Cross. Distribution of personnel indicated hereon is advisory. Variation therefrom will be left to the discretion of the commanding officer of the hospital. Normally hospitals are divided into administrative and professional services. Professional services are usually further subdivided into medical, surgical, dental, laboratory, and X-ray services.

The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number above 500 refers to a military occupational specialist listed in Cfr. No. 14, War Department, 1942.

Civilian personnel

In addition to military personnel listed hereon, services of the following civilians are required in the larger station hospitals.

General Principles of Evacuation. Our present system or method of evacuation is an evolution of that employed in the World War and experiences to date during the present war. There are certain general principles which control efficient evacuation. Beginning with the moment that a man is wounded at the front, there must be a continuity in his handling and treatment until he is again fit for release from the control of the Medical Department. Commencing at the front, there is a constant sorting of casualties with a view of determining which are to be evacuated and how. All cases who can perform duty and are not a menace to the health of the command are returned to their organization as promptly as possible. No cases are sent farther to the rear than the military situation and their own condition demand. Cases which can be treated successfully within a command are not evacuated unless it is necessary to relieve the command of their care in order to free it for movement or to make room for new cases. Serious cases are transported the shortest possible distance consistent with the military situation and their proper treatment. Cases requiring prolonged treatment are sent to the communications zone and from there to the zone of the interior. The medical personnel attached to each unit collects and gives immediate care to casualties within its own area. Evacuation from each area is made by units in rear thereof. During periods of activity, casualties are evacuated rapidly through forward clearing stations and hospitals to the communications zone; in periods of inactivity, the evacuations are less numerous and less rapid. Plans and orders for evacuation are made in conformity with combat plans and orders. The proper execution of evacuation requires that the medical service be familiar with the combat plan in ample time for it to make proper arrangements.

Bed Requirements for Combat. It has been intimated before that evacuation presumes established beds to which the wounded may be evacuated. Arrangements for evacuation for any given combat operation must, therefore, include provisions for hospitalization. In estimating the number of fixed beds to be made available to meet the requirements of a single severe engagement, the losses of the 1st Division in the Aisne-Marne operations, July 18-23, 1918, may be taken as a basis.

The rates given below are daily rates for a severe engagement, not average rates.

Infantry regiment	12-15 per cent
Infantry division	6-8 per cent
Infantry corps	3 per cent

These rates include the killed: (16 per cent to 20 per cent of all casualties).

The ratio of killed to the wounded by gas and gunshot missiles is 1:6.

The ratio of killed to the wounded alone is 1:4.

In making an estimate as to the number of beds to be made available to meet the needs of one field army, the number of front line divisions engaged may be taken as a basis. This will usually be a more accurate method of estimating than by using a casualty rate for the corps or for the army in entirety. All divisions will not be engaged in severe combat, hence an average casualty rate of 6 per cent is a liberal estimate. The great majority of corps and army troops are not subjected to hostile fire as are the divisional troops; neither are all corps likely to be engaged equally. Thus one army of 9 divisions may have 7 front line divisions engaged:

Troops engaged, 154,000 \times .06 = 9240 casualties, of which 16 per cent (1478) are killed.

9240 minus 1478 equals 7762 wounded and gassed.

While some of these casualties will not reach fixed hospitalization, some sick from the entire army will do so. These factors should partially equalize themselves. There will also be some battle casualties among corps and army troops. On this basis, it may be estimated that 8000 fixed beds should be available for an army with 7 divisions in the front line for each day of severe fighting. Available beds to meet evacuation requirements for expected engagements will vary from these figures (or more) to those required to meet the average rates given in paragraph, "Hospital Allowances."

Policy of Evacuation. The general policies regarding evacuation and hospitalization within the theatre of operations are formulated by general headquarters. The methods of carrying out these policies is described later.

Classification. Evacuation includes two classifications, primary and secondary. *Primary evacuation* includes evacuation within the theatre of operations, while *secondary evacuation* includes that from the theatre of operations to the zone of the interior. The policy of evacuation, announced by general headquarters, determines what classes of casualties are to be treated in the theatre of operations and what classes are to be sent to the zone of the interior. What the policy may be has a great influence on the medical activities of the communications zone and affects particularly the hospitalization project of this zone. The few who do finally return to duty will do so after prolonged treatment and probably will be fit only for special service. Therefore, the total number of patients, less the percentages adjudged to be permanently incapacitated, should be the maximum treated in the theatre of operations.

Primary evacuation within the theatre of operations is of two types: evacuation to army (combat zone) hospitals and evacuation to communications zone hospitals. It is with the latter that the discussion of evacuation will deal. Evacuation within the communications zone is often necessary. Although this is in the nature of a secondary evacuation, the term "secondary evacuation" refers to the transfer of casualties to the zone of the interior.

	1	2	3	4	5
	Unit	Technician grade	Hospital train	Enlisted cadre	Remarks
2	Major		1		<p>* In charge of dressing room, ward car. The serial number symbol shown in parentheses is an inseparable part of the specialist designation. A number below 500 refers to an occupational specialist whose qualification analysis is found in AR 615-26. A number above 500 refers to a military occupational specialist listed in Circulars Nos. 14 and 67, War Department, 1942.</p>
3	Captain		1		
4	Lieutenant		2		
5	Total commissioned		4		
6	Nurse		6		
7	First sergeant (585)		1	1	
8	Staff sergeant, including		1	1	
9	Mess and supply (324)		(1)	(1)	
10	Corporal, including		1		
11	Technician, surgical * (225)		(1)		
12	Technician, grade 3		1		
13	Technician, grade 4		6	2	
14	Technician, grade 5 including		8	2	
15	Private, first class		6		
16	Private		9		
17	Clerk, general (405)	5	(1)	(1)	
18	Clerk, stock (324)		(1)		
19	Cook (060)	4	(2)	(1)	
20	Cook (060)	5	(2)	(1)	
21	Cook's helper (521)		(2)		
22	Pharmacist (149)	4	(1)	(1)	
23	Technician, medical (123)	4	(2)		
24	Technician, medical (123)	5	(3)		
25	Technician, medical (123)		(7)		
26	Technician, surgical (225)	3	(1)		
27	Technician, surgical (225)	4	(1)		
28	Technician, surgical (225)	5	(2)		
29	Technician, surgical (225)		(2)		
30	Basic (521)		(3)		
31	Total enlisted		33	6	
32	Aggregate		43	6	

Plate 16. T/O 8-520, April 1, 1942. Organization of the Hospital Train.

Means of Evacuation (FM 8-35). The means of transporting sick and wounded from evacuation hospitals in the combat zone to a hospital in the communications zone consist of *hospital trains*, *trains for patients*, *hospital ships*, *hospital boats*, and, occasionally, *motor convoys* and *airplane ambulances*. The usual method of transporting patients from the evacuation hospitals in the combat zone to general hospitals in the communications zone is by means of hospital trains.

Hospital trains. (T/O 8-520). Hospital trains are Medical Department organizations, the type train having a capacity of 360 patients. Their distribution and use is controlled

1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
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1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13	14	Remarks
1	Unit	2	3	4	5	6	7	8	9	10	11	12	13		

by the Medical Department. As regards personnel, supply, and maintenance of their medical equipment, they are administered under the direction of the chief surgeon of the field force except those assigned for evacuation within the communications zone. As railway units, they are operated and maintained mechanically under the direction of the Corps of Engineers. The number of hospital trains required depends on the type and severity of combat and the location of the theatre of operations and the conditions existing within it. Hospital trains are of two types, the *standard* and the *improvised*.

The *standard hospital train* as used in the World War consisted of 16 cars, of which 10 were ward cars exclusively devoted to carrying the sick and wounded and the remaining 6 were given over to administration, messes, pharmacy, operating room, train personnel, and stores. The train had a capacity of 360 patients recumbent and 720 sitting. In the ward cars, the beds, 36 in number, especially designed, were removable and in case of necessity could be used as litters and could be folded against the side of the coach or lowered to the floor. In the double tier arrangement, the lower tier may be used as a settee while the top tier is still being used for recumbent cases. By this arrangement the less seriously wounded are made comfortable and can either sit or lie down. A so-called "sitting case" cannot remain so for a prolonged period; it is therefore necessary during a long journey to provide beds for sitting patients. As far as personnel, material, supply, and other conveniences are concerned, trains of this type are virtually rolling hospitals. They must be vestibuled to permit the serving of hot meals and the giving of surgical attention enroute.

Another type of hospital train employed is one made up of the desired number of ordinary Pullman or tourist sleeping cars, and engine and baggage car to which is added a so-called "unit car." The unit car may be an altered baggage, coach, or dining car; it contains the kitchen, pharmacy, operating room, a few beds for special cases, and other facilities needed by patients en route. While such trains lack the refinements found in the standard hospital train, their use offers certain advantages of which the most important are availability, economy, and flexibility. Trains of this type may be made large or small to suit the demands of each journey. The type train, T/O 8-520, April 1, 1942, however, has a normal capacity of 360 patients.

Agencies Involved in Evacuation. The agencies involved in the process of evacuation from the combat zone to the communications zone are: the *evacuation hospital*, the *hospital train*, *medical hospital ship* (see Plate 17, T/O 8-537 Medical Hospital Ship Company), the *surgeon of the army*, the *G-4 of the army*, the *regulating station*, the *chief surgeon of the field force* and *G-4, GHQ*. The surgeon of the communications zone also has a function in that he allots specific "bed credits" to regulating officers. The regulating stations play the most important role in insuring expeditious evacuation. These stations are the agencies which control the movement of all sick and wounded evacuated from the mobile medical installations of the combat zone to the fixed hospitals in the communications zone.

Regulating Stations. Regulating stations are established and administered under the direction of G-4, general headquarters. Each regulating station serves a definite area, usually one army. They are usually located in the rear of such areas at controlling points where the necessary trackage exists or can be quickly installed. They should be near enough to the front so that trains can arrive at railheads in 12 hours. They should have 2 railroad lines to the front and rear and also a line for lateral movement. The limits of the army areas are therefore often fixed by general headquarters with these particular features in mind. A regulating station consists of a rather large railroad yard with a sufficient number of tracks, with the necessary crossovers, switches, sidetracks, and facilities for handling a one day's supply of food, forage, ammunition, and other items that might be kept there for urgent use.

Regulating officer. The regulating officer commands the station and all installations thereat for the operation of which the use of trackage or of routes leading to the front is necessary. He is a direct representative of the commanders of the theatre of operations, who assigns him a suitable staff representing the various services. Priorities in movements from rear to front are fixed by the regulating officer pursuant to the demands of the

command that his station serves. All calls for supplies, all notices and requests for troop movements, and all requests for evacuation are sent to the regulating officer who, in accordance with these advices, controls the flow of supply and movements between front and rear.

Medical Department Activities at Regulating Stations. *Medical Regulator.* At the regulating station there is a medical group on the staff of the regulating officer. The senior of this group is known as the "medical regulator." This officer supervises the movement of hospital trains and handles all evacuation matters. The commanding officers of hospital trains assigned to his station are directly answerable to him in all matters pertaining to Medical Department administration. A veterinary officer is detailed as an assistant to the medical regulator to handle matters relative to the evacuation of animals.

The regulating officer (or medical regulator), upon the receipt of a call from G-4 of the army, will assign trains and arrange the necessary schedule, advising the evacuation hospital and the G-4 of the probable time of arrival and the period of time allotted for loading and the class of cases that can be loaded on it. The commanding officer of the evacuation hospital will be charged with seeing that the necessary steps are taken in order that the train may be promptly loaded in the time allotted. Specific loading directions as to the class of cases to be taken abroad are necessary, as the medical regulator may order the train on its trip to stop at other hospitals to take on selected cases. In directing a movement of this sort, the medical regulator is guided by the availability of beds in the rear. These beds are allotted daily by the surgeon, communications zone.

Data. Hospital trains are assigned to or placed under the immediate control of regulating stations by G-4, GHQ, on the recommendation of the chief surgeon of the field force. Suitable railroad yards for them are designated by the regulating officer. With the requisite number of hospital trains at his disposition the medical regulator must be furnished daily with two essential data:

First, regular reports from G-4, Army as to the number of patients he will be expected to evacuate by hospital train. These "reports" will frequently be direct requests to evacuate specific hospitals in definite priorities instead of routine information.

Second, regular reports from the rear as to the number of beds available to which patients can be evacuated.

Reports. Evacuation hospitals report daily or as often as may be necessary to G-4 Army (through the army surgeon) the following information:

Number of evacuable wounded, sitting and lying cases.

Number of non-evacuable wounded.

Number of evacuable sick, sitting and lying cases.

Number of non-evacuable sick.

Number of vacant beds.

Bed credits. The surgeon, communications zone, maintains in his office a daily balance in terms of beds, showing the current condition of hospitalization resources. Each general and station hospital in operation notifies him daily by telephone, telegraph, or mail, of certain essential data, among which are the total number of vacant beds and the number of patients in hospital. These he tabulates and from the aggregate so obtained reviews the general situation and makes allotments for primary or other evacuation movements. The surgeon, communications zone, wires daily to the medical regulator the number of beds set aside exclusively to receive evacuations being handled through that particular regulating station. Once these allotments are made they cannot be changed except by mutual consent of these two officials.

The medical regulator must always know that his credit in terms of beds at certain hospitals is at par until he himself has used it; otherwise, confusion in the movements of hospital trains and needless suffering on the part of the patients might ensue. A bed-credit in a specific hospital is of little use to a regulating officer unless the credit is at least 300 beds, that is, enough to take one train load of patients. In emergencies and particularly with sudden changes in the battle front; the chief surgeon may set aside certain hospitals in the forward areas of the communications zone for use by the medical

regulator, notifying the surgeon, communications zone, promptly as to this action and at the same time directing the hospital commanders to report the number of vacant beds direct to the medical regulator. Bed-credits in a specific hospital center or general hospital should be allotted to a single regulating station only.

A practicable arrangement that was occasionally sanctioned during the World War was to permit regulating stations to "trade" bed-credits. That is, when one station became short of bed-credits or desired to avoid a long haul on account of the type of train being used, the medical regulator at one station called up the regulator at another station and requested an allotment to him of a requisite number of beds at some hospital credited to the latter. As soon as this was done, the beds so loaned passed out of the control of the second regulator and were stricken from his daily balance as no longer available. When it is necessary to relieve evacuation hospitals of their encumbrance of wounded, it may become necessary to evacuate patients before they have received surgical treatment. Such cases are classed as "pre-operative" and are sent to general hospitals in the forward areas of the communications zone.

Regulation of trains. In addition to regulating evacuations, the medical regulator must work in close touch with the railroad technicians as to the movements of empty trains on return trips as well as for the preparation of "operating schedules" for the loaded trains. When the latter are not kept constantly moving, space where they can be side-tracked, yet remain available for use in any emergency, must also be designated. The medical regulator is the representative of the chief surgeon of the field force in all matters relating to the medical personnel on the trains and, under the direction of the regulating officer, he must also provide facilities for the supply of rations, general medical supplies, distribution of mail, and for rations for patients. The latter is most important. Trains entering the combat zone must carry with them sufficient rations to feed the capacity of the train throughout the journey.

Evacuation Within the Communications Zone. Allotment of trains. In addition to the by G-4, GHQ, directly under the control of the commanding general, communications trains specifically assigned to regulating stations, a number of hospital trains are placed zone, and held at suitable places designated by the latter. These trains are utilized in accomplishing what may be termed "communications zone" evacuation or "intermediate" evacuation. This is a second stage of primary evacuation. Train movements are coordinated by G-4 at headquarters communications zone on recommendations of the surgeon, communications zone. Through a working agreement usually sanctioned by G-4, the surgeon, communications zone, calls direct upon the Director of Transportation for such movement of those hospital trains as the Medical Department may desire.

Necessity for evacuation. Evacuations from the communications zone become necessary because approximately 20 per cent of all sick and wounded remaining under treatment for more than two weeks become permanently incapacitated for further military duty and require evacuation to the home territory for eventual discharge from the service. This fact alone necessitates a constant flow of such patients to hospitals at base ports, or where water transportation is not necessary to those hospitals near important railway junctions serving as exits to home territory. During periods of comparative inactivity at the front the medical regulator attempts to select patients for evacuation from the combat zone and to route them to those hospitals of the communications zone that are best qualified to render the particular treatment required. Thus he may direct a hospital train to call at several evacuation hospitals and to transport all fracture cases to a general hospital peculiarly equipped to take care of them. Likewise, he may select those patients offering prospects of speedy recovery and return to duty and direct their transfer to hospitals near the front. This reduces the mileage demands on rolling stock and facilitates replacement procedure. However, in times of stress, a medical regulator can seldom afford to observe this desirable selection of patients or to make primary evacuations far to the rear. By doing so, he would suffer considerable loss in the "utility schedule" of his hospital trains.

Whenever combat activity becomes intensive, with great numbers of sick and wounded flowing into the evacuation hospitals, the medical regulator, guided by his bed allotments, is forced to play safe and prescribe the shortest trips possible for the hospital

trains under his control, in order that his resources may be utilized to maximum advantage. The medical regulator relies upon the surgeon, communications zone, to accomplish communications zone evacuation and keep the hospitals near the front as empty as possible. Therefore, in very active periods, instances will arise where a hospital may be receiving patients from the front on a hospital train dispatched by the medical regulator, and at the same time be sending out to hospitals toward the base specially selected patients on trains independently ordered up for that purpose by the surgeon, communications zone.

Hospital trains operating under communications zone control usually cover much greater distances in quicker time than can be done by hospital trains operating in the combat zone. In the combat zone, the *daily traffic density* may reach 72 trains per 24 hours, a supply, troop or hospital train passing through a given station every 20 minutes. When rail lines are thus crowded, movement is slow.

Secondary Evacuation. Evacuation to the home territory by hospital ships or by hospital trains requires no special description as they resolve themselves into those of routine selection, classification, formation into sick and wounded convoys for purposes of record, delousing whenever necessary, and transfer as accommodations become available. During World War I ordinary troop ships and not hospital ships were generally utilized. While aboard ship, the sick and wounded being transported to the United States were under the control of the Navy by special agreement entered into between the Secretaries of War and Navy. Upon debarkation, the patients reverted to the control of the Army and were distributed from debarkation hospitals at the ports to the military hospitals throughout the country. Hospital trains of the zone of the interior were operated in a manner similar to that used in operating hospital trains under communications zone control. When the communications zone adjoins the zone of the interior, hospital trains pass from one zone to the other. In this case there is joint control, movements in and out of the theatre of operations being controlled by a regulating station near the rear boundary of the communications zone, and movements within the interior being controlled by agencies of the latter.

PERSONNEL

Responsibility. The chief surgeon of the field force is responsible for Medical Department personnel matters relative to requirements, distribution, priority of replacement, and training in accordance with the general policies of the commander of the field forces. Medical Department personnel within the theatre of operations is administered and controlled in accordance with the policies announced for all classes of personnel within the force, the major part of this administration being performed by the organization to which the officers, soldiers, or nurses are attached or assigned or of which they are an integral part. The surgeon's office, communications zone, functions as an administrative agency in carrying out the policies of general headquarters. As such it initiates all actions looking toward the distribution of the great numbers of Medical Department personnel required by an expeditionary force.

The Personnel Section, Office of the Surgeon, Communications Zone. The primary function of the personnel section of the communications zone surgeon's office is the distribution of Medical Department personnel. This section, however, does not work alone. The other sections of the office are interested to some extent in personnel matters. Each activity within the theatre involves medical personnel. Successful handling of personnel matters is dependent on a well-organized personnel section which coordinates the demands made upon it. Its principal contacts will be with G-1, the Adjutant General, and with those sections of his own office that are particularly interested in the distribution of professional talent. The chief of this section should be an officer of the permanent establishment whose experience has given him a broad acquaintance with the medical profession of the nation and with the members of his own corps. Advise with reference to dental, veterinary, and nursing personnel questions must always be available to this section of the office; a representative of these corps should therefore be on duty therein.

Classes and Distribution of Medical Department Personnel. The Medical Department is responsible for the procurement and distribution of the following classes of personnel:

Commissioned:

Medical Corps.
Dental Corps.
Veterinary Corps.
Medical Administrative Corps.

Nurses:

Nurse Corps—graduate.
Nurse's Aides—undergraduate.

Enlisted:

Medical Service.
Dental Service.
Veterinary Service.
Civilian
Dieticians.
Physiotherapists.
Clerks and others.

This personnel is dispersed throughout a field force in one or another status as follows:

Assigned to units.
Attached to organizations.
Detailed as representatives.
Replacements.
Detailed to civil work or with relief societies.

Percentage of Medical Department Personnel. The percentage of Medical Department personnel in a field force varies according to several factors, the principal one being the general nature of the military effort which determines the amount of fixed hospitalization that is to be established in the theatre of operations. Taking into consideration all military forces, in both the zone of the interior and the theatre of operations, it is estimated that Medical Department personnel will constitute approximately 12 per cent of the aggregate military personnel required for a major effort. In a minor effort, where comparatively little combat is expected, the proportion would be smaller. War strength tables of organization are based upon a contemplated major effort in which the Medical Department requirements are estimated as follows:

Officers	1.2 per cent
Nurses .....	.8
Enlisted	10.5
	<hr/>
	12.5 per cent

Classification. A detailed percentage classification may be given as follows:

Commissioned:

Medical Corps .....	.75 per cent
Dental Corps .....	.1
Veterinary Corps and Sanitary Corps .....	.3
Medical Administrative Corps .....	.05
	<hr/>
	1.2

Enlisted:

Medical Department (including medical and dental attendants), approximately	9.5
Veterinary Corps	1.
	<hr/>
	10.5

Nurses:

Nurse Corps8
TOTAL	12.5 per cent

Basics for Estimating Medical Personnel. The Medical Department personnel required in either the combat zone or the communications zone cannot be estimated with any degree of accuracy without a knowledge of the specific theatre of operations and of the organizations of the forces therefor.

While it is sound policy to assume that Tables of Organization show all the personnel required within a field force, experience has shown that in practice the medical personnel problem presents difficulties if the allowances given in Tables of Organization are adhered to strictly. Unusual or un-anticipated situations are almost certain to occur in connection with combat activities. Medical establishments are often obliged to care

for more than double the number of patients for which they were organized. Differences therefore may exist between the totals shown on Tables of Organization and the total medical troops actually required in a given theatre of operations. In planning for the organization of a field force, each theatre of operations will present a different problem. Medical personnel should therefore be considered not only on a table of organization basis but also on the basis of estimated needs. Whether the latter should be on a percentage basis is immaterial except that such is a convenient method in keeping track of the medical personnel accruing to the field force.

A specific war plan must further indicate the basis upon which medical units will accrue to the credit of the forces. It is desirable to stress the statement that the Medical Department personnel that is to accrue to the credit of the force must keep pace with or be slightly in advance of the authorized allowance based upon the strength and composition of the forces in question. Experience indicates that this is a policy difficult to maintain. Changing conditions in a theatre of operations demand changes in the rate of delivery of combat troops to the theatre. If the flow of medical personnel to the theatre does not keep pace with the flow of combat troops, just that much will the operations of the combat forces be hampered by lack of medical support.

Personnel Replacements. It is essential that medical units within the theatre of operations be maintained at full strength if they are to function efficiently. Provisions for replacement of personnel is an important feature of any war plan, the rate varying according to circumstances. From past experiences it appears that not enough consideration has been given to this subject. The matter of furnishing trained replacements to a field force is a function of the zone of the interior. The chief surgeon in the theatre of operations, however, is materially concerned as to Medical Department replacements and must make representations as to his requirements when necessary. The administrative details necessary to the distribution of replacements, once they arrive, are functions of the communications zone authorities. The priority of such distribution is made in accordance with the policy of general headquarters. Priority is usually given to the combat zone, although such a policy may not always be desirable regarding medical replacements. In order to permit flexibility, replacements are echeloned in depth. In a small field force, medical replacements, except perhaps in the case of nurses, may be advantageously placed in the general replacement pool, depot, or battalion. With a large task force, however, many advantages are offered if medical replacements within the communications zone can be grouped in camps or areas controlled by the Medical Department, *i.e.*, Medical Department Concentration Centers.

Concentration and Distribution of Medical Department Personnel and Units. Depending on the character of the theatre of operations and the geographical distribution of the field forces, one or more Medical Department Concentration Centers are established in the communications zone.

Medical Department Concentration Center (see T/O 8-600-1). If only one center is established, it should be centrally located at a place having good communications with the front and rear, but particularly with the front. It should also be near a communications zone medical depot. In the case of a deep communications zone, two such centers are desirable. One of these should be at the base, situated on or within easy reach of the avenues of approach into the theatre of operations. The other should be well forwarded and centrally located behind the combat zone. These centers serve not only as reservoirs for the reception and distribution of replacements; they have other functions which are perhaps more important.

Incoming units. All Medical Department troops arriving in the theatre of operations, except those regiments and detachments that are components of divisions, should be sent to the concentration center at the base unless they are to be immediately assigned to operate an establishment. The medical units pertaining to the communications zone (general and station hospitals, laboratories, veterinary general and station hospitals, etc.) and those belonging to the army medical service (evacuation and surgical hospitals, etc.) all require bulky equipment. The personnel of these units will ordinarily arrive in the theatre of operations unaccompanied by this equipment. The concentration of this per-

sonnel under coordinated central control at a center facilitates their administration and distribution, permits them to continue training under proper supervision, and allows the assembly of their equipment. It is not contemplated that the equipment necessary to operate communications zone establishments, such as hospitals, be sent to a center. These supplies are forwarded by supply agencies to the places where the establishments are to be located. The mobile units of the army medical service may be furnished their organizational equipment at the center. This may be done either at the center, at the base, or in the forward area of the communications zone, depending on the policy of GHQ. The equipping of the units is greatly facilitated by having them thus grouped. An organization remains at a center until its assignment has been determined or the establishment it is to operate is available for it.

Reserve units. A Medical Department Concentration Center also has a strategic feature in that the evacuation, surgical, and veterinary evacuation hospitals and the auxiliary surgical groups pertaining to the general headquarters reserve may be assembled and used as a pool under central control. Not only these units but other medical organizations that are normally components of a field army may be held and distributed to that army area where their services are most needed. A center also provides a place to which a unit, depleted in personnel and equipment by long operation at the front, may be withdrawn, overhauled, and rehabilitated. Without such a center the medical service would lack the elasticity necessary to utilize its replacements and reserves to best advantage in conserving the strength of the field forces.

Control. Medical Department Concentration Centers are controlled by the chief surgeon at general headquarters. As those headquarters are not usually concerned with the details of supply, administration, and operation, the direction exercised by the chief surgeon may be only the control of the assignment of units or replacements to such centers and their distribution therefrom. If such is the case, the local administration of the activities of the center, *i.e.*, training, supply, equipping, overhauling, and rehabilitation of the units, are supervised by the surgeon, communications zone.

MEDICAL SUPPLY

Introduction. The Medical Department is responsible for the supply of all medical material necessary for the health of the troops and for the care of the sick and wounded in the theatre of operations and in the zone of the interior. This responsibility involves provision for the care of animals as well as men. It includes all activities from the determination of supply requirements to the delivery of supplies to the individuals who use them. See Chapter VII, Part I, "Supply and Evacuation of Large Units."

Estimate of Requirements. Any plan for contemplated military operations must include a plan of supply for the theatre of operations. A plan suitable for one situation probably will not fit all situations. However, certain general principles have been adopted in order to insure the flow of supplies from the zone of the interior to front line troops. These fit into any general scheme of supply and are susceptible to comparatively little change in varying conditions of warfare. One of the phases of the supply plan is an estimate of the material required and the date and place at which it must be made available. Such is an important feature of every special war plan.

Factors. Some of the factors to consider in estimating medical supply requirements are:

The plan of operations.

Mission.

Size, organization, and equipment of the force.

Plan of concentration, rapidity, and location.

Time and dates of various phases of mobilization, concentration, and operations.

Rate of movement to the theatre.

Type and probable duration of operations.

Character of the theatre of operations.

Location adjacent to, or near, the zone of the interior or overseas.

Roads, railroads, and other means of transportation and lines of supply.

Resources which may be made available locally.

Construction required for lines of communication, *i.e.*, hospitalization, and shelter required for medical supplies.

Climate and health conditions.

Population.

Characteristics of the enemy.

Military preparedness.

Military capacity.

Type of armament.

Probable movements and objectives.

Length, capacity, vulnerability, and type of lines of communication between zone of the interior and theatre of operations.

Medical supply plan in zone of the interior.

Plan of mobilization of resources.

Status of program for mass production, procurement, and storage.

Availability of supplies at various dates.

Medical estimate. An intelligent estimate of the medical material required cannot be made by the Surgeon General unless the above mentioned factors have been furnished and considered. A further necessity in making such an estimate is a list of items that constitute the medical material and the amount required under varying conditions.

The *medical supply catalogue* lists every item that is routinely issued by the Medical Department. It is apparent that there must appear therein every medical item that is contained in any equipment table.

An *equipment list*, based upon the supply catalogue, is provided for each type medical unit. Each list shows all of the medical equipment necessary for a unit to begin functioning. It is intended to include in each of these lists all equipment necessary for a unit to function, including that furnished by the Quartermaster Department and other supply agencies.

Renewal of supplies consumed are provided for in the supply catalogue, allowance tables, and other directives.

Initial, Maintenance, Reserve, and Automatic Supply. As the *impetus of supply is from the rear*, the Surgeon General in the zone of the interior is responsible for the procurement of medical supplies and their delivery to the theatre of operations. The Surgeon General, however, is influenced by the demand of the theatre of operations from time to time as to the general character and quantity of material required. The communications zone authorities are responsible for the utilization of local resources of the theatre, under policies established by general headquarters.

Classes. The requirements of medical supplies for a field force may be divided into three categories: initial equipment for troops and Medical Department units, material for maintenance, and that required to establish a reserve.

The material required as *initial equipment* of troops and Medical Department units, often termed organizational equipment or unit equipment, is covered as to quantity, type, and weight in equipment lists. Organizations entering the theatre of operations ordinarily are accompanied by this type of material. The equipment pertaining to many Medical Department organizations, *e.g.*, general hospitals, is so bulky that it may not actually accompany the personnel. In all such cases, it is important that such equipment arrive in the theatre of operations simultaneously or before the arrival of the personnel which is to use it.

Maintenance supplies, to replace those consumed, are forwarded from the zone of the interior at the time field forces enter the theatre of operations or immediately thereafter. These supplies constitute the initial stock of the depots that are to be established in the theatre of operations. These depot stocks are maintained by a continuous flow of supplies from the zone of the interior. The kind and quantity of material needed to keep the command fully equipped and supplied for the duty upon which it is engaged is dependent upon factors that differ widely with each situation. The climate, health conditions, local resources of the theatre of operations, the nature of military operations, and the military characteristics of the enemy all have a bearing.

Reserve supplies are shipped to the theatre along with the maintenance supply until the desired reserve is established. The purpose of a reserve is to assure a source of supplies for the furtherance of military operations. The amount of reserves established is usually expressed in days, as 45 days' reserve. The size of this reserve is dependent upon many factors, some of which are:

The length, capacity, and vulnerability of the lines of communication between the zone of the interior and the theatre of operations.

The type of the operations and the armament and strength of the enemy.

The availability of local resources in the theatre of operations.

The probable duration of operations.

The *automatic supply* is based upon an estimate of the amount of medical supplies required to meet the daily needs of troops (maintenance) and that required to establish a reserve estimated on the basis of the amounts that experience has shown to be required for a fixed number of troops for a given time. The monthly consumption rate for a unit of 25,000 men is estimated for each item of supply, based on authorized allowances and experience. The quantity thus arrived at for each item is designated as the "automatic supply unit." The multiplier for the "automatic supply unit" is the number of troops in the theatre of operations divided by 25,000. Shipments of these units to the theatre of operations are continued at a designated rate until a change is requested.

Exceptional supply. This includes special items and articles the need for which cannot be determined far in advance. The requirements for such are computed as the needs develop, and calls are made therefor in specified quantities.

Organization for Supply. The cardinal principles governing an efficient supply system are flexibility, elasticity, mobility, and simplicity. Large accumulation of supplies close in rear of combat troops tends to rigidity, rendering the system incapable of adjustment to changes in the situation. To provide against this and also to permit decentralized operation, the communications zone is often divided into sections: base, intermediate, and advance. The base section depots provide for receiving, classifying, assembling, and storing supplies received from the zone of the interior. The intermediate section depots keep a store of balanced stocks nearer the troops but far enough from the front to be safe from hostile interference. The advance section depots contain balanced stocks in quantities only sufficient to meet the immediate needs of troops in combat.

Modification. The organization and administration of the supply system in different theatres of operations will not usually be the same. The tendency is to assume a fully organized and multiple sectioned communications zone under all conditions or at least that a different organization would be unusual. The reverse will usually obtain. The communications zone will be built up from the simplest base even in major operations. In minor operations, the communications zone may be nothing more than a base. The situation may vary from a more or less elaborately organized communications zone to one sufficient only to establish contact with the zone of the interior, the resources and establishments of the latter being drawn upon directly for the maintenance of troops. If the theatre of operations is in the home territory or contiguous thereto, or if geographical conditions do not favor an elaborate organization along the lines described, it may be advisable to eliminate the intermediate section altogether or to omit the division of the communications zone into sections. In the latter case, the communications zone is organized as described for the advance section, and the classification and assembly of supplies are made in depots of the zone of the interior. Depending upon the distance of the theatre of operations from the zone of the interior, the size of the forces in the theatre of operations, the character of the operations, and availability of the communications net, supplies received from the zone of the interior are collected into depots of the communications zone or forwarded without transloading direct to railheads of the combatant troops. The latter condition obtains normally only at the beginning of operations in theatres contiguous to the home territory; the movement of supplies is then controlled by regulating stations inserted in the communications net at or near the rear boundary of the theatre of operations.

Storage. Storage may be looked upon as an agency of distribution by which the move-

ment of supplies is facilitated rather than as an agency for keeping supplies safe and in order. It would be ideal to keep supplies rolling from the point of origin to the place of consumption. However, it is always necessary to have reserves. By storage, reservoirs of supplies are maintained with which to meet uneven demands and irregular transportation facilities and with which to balance production with demand. Storage should be sufficient for this purpose and no more. The commander of the theatre of operations, in conjunction with the commander of the communications zone, decides on the location of all important supply installations and the amount and distribution of supplies. Storage space in the communications zone is allotted to the Medical Department by the commanding general, communications zone. This includes determination as to the location of depots as well as other supply establishments pertaining to the Medical Department. The surgeon, communications zone, keeps adequate record of all storage space allotted to the Medical Department, including its disposition and utilization. He makes application and recommendation to the commanding general, communications zone, for any additional storage space or depots that may be required from time to time by the Medical Department, in order to meet his responsibilities. The surgeon, communications zone, stores and maintains at the prescribed level the special supplies procured by it, such general supplies as are used exclusively by it, and such other general or special supplies used by medical troops as may be authorized by the commanding general.

Depot administration. Each general depot is commanded by an officer designated as "Commanding Officer," such and such "General Depot," etc. (See Chapter VII, Part I.) At each general depot in which medical supplies are stored, the Medical Department is represented by a Medical Department officer known as the *Depot Medical Supply Officer*. Each depot medical supply officer is responsible for:

The proper storage, care, maintenance, and issue of all supplies, equipment, and material pertaining to his branch, under such instructions as may be prescribed by the chief of his branch.

The control of the necessary technical personnel, military and civilian, to handle and record supplies pertaining to the Medical Department.

Supervision of the unloading and loading of supplies pertaining to the Medical Department, proper marking of all shipments and transmission of information in regard to shipments to consignees, through prescribed channels, in accordance with instructions issued from time to time by the surgeon, communications zone. Under no circumstances will a depot supply officer arrange for transportation except through the duly constituted transportation agencies under the supervision of the commanding officer of the depot.

Whenever any shortage of stock is indicated or anticipated in any article of supply, or the necessity arises for special control of expenditures or reduction of allowances, a depot medical supply officer will bring the matter at once to the attention of the communications zone surgeon, and the latter will take the necessary steps to relieve the shortage.

Depot supply officers communicate directly with the depot commander concerning matters pertaining to storage space. Correspondence pertaining to technical matters is directed to the surgeon, communications zone; all other correspondence is governed by orders and regulations on the subject issued from time to time.

Medical Depots (T/O 8-661). (See Chapter IV). *Location.* Ordinarily, the existing facilities of a theatre of operations will be utilized for medical depots, as time may not permit the months of delay entailed by construction. Transportation may not permit the movement of construction material. Certainly the first depots established must utilize existing shelter. Buildings so selected must not only have suitable and sufficient storage space but also adequate transportation facilities. They should be located with railroad siding advantages on or immediately adjacent to a main railway line having good connections with both front and rear.

Construction. When it becomes necessary to construct a medical depot, the following factors should be borne in mind:

The space should be laid out in separate areas for each class of supplies represented at the depot in the necessary proportion.

Each storehouse area is divided in sections, each section having a ladder rail track to

each side connected by house tracks about 1700 feet long, there being one for each three warehouses. These tracks should be about 150 feet apart, giving space enough for open storage on the opposite side of the track from the houses and at the same providing a firebreak.

There should be no dead end in the track system except where particularly desired for unloading vehicles, so that railroad cars can be moved with the greatest facility.

Different types of storehouses should be distributed on separate tracks so that one particular commodity can be stored on separate tracks, as it is desirable for facility in receipt and distribution that the commodity be loaded on one track while it is being received on another.

Storehouses should be of such size as to involve the minimum amount of labor in handling stores. A 60-foot width and a length of 400 to 500 feet are considered the most economical from the standpoint of both operation and construction.

When time, labor, and material permit, which is seldom the case, operation is facilitated by placing the floor of the storehouse on a level with the floor of the average freight car. However, it will usually be necessary, due to dearth of material, to construct many storehouses without floors and to place drainage wherever required.

Storehouses (or open storage) from which shipments are made by truck, should be on a flank so as to avoid crossing railroad tracks and the delay usually caused thereby. These storehouses should be located as far as practicable on existing roads.

Storehouses should not be located so as to interfere with existing roads, as it takes more time to construct new roads than any other feature and the material for their construction is often difficult to obtain.

Receiving, classification, and departure yards are essential features of all large depots.

The building program must be carried out so that expansion is feasible and so that each unit is completed progressively and in succession in such a way that it can be used immediately. For example, it is wrong to start construction on a number of storehouses when only one house is needed at once, and it is wrong to lay ten railroad tracks in a yard before alining and ballasting any, when perhaps only three tracks are needed immediately. The loss of efficiency due to using small units is insignificant compared to the importance of fulfilling the requirements of the military situation.

Storage space is usually expressed in terms of square feet of floor space. Storage space required for Medical Department supplies for a 45 day reserve may be estimated as 0.5 square feet (8-foot stack) per man in the forces. This amount will vary according to the amount of reserve and maintenance stores contemplated.

Echelonment of Medical Depots. The system of supply contemplates that medical units with troops shall normally be encumbered with the minimum of supplies, thus insuring a maximum of mobility. The agencies of distribution of medical supply in a large communications zone, completely organized, are echeloned from rear to front as follows:

Communications zone depots (medical section): base, intermediate, and advance.

The base depot or depots are established first. The others are established as the necessity for such becomes evident. The communications zone depots serve the entire theatre of operations and, therefore, stock all medical supplies (medical, dental, and veterinary) authorized for communications zone medical activities. The stock of advance depots may, however, be limited to that required by combat zone troops, the base or intermediate depots supplying the needs of fixed installations of the communications zone. If intermediate depots are established, they will usually contain the bulk of medical supplies within the theatre of operations.

Combat zone depots: One army medical depot serves each army, although it may be divided to operate in several places. Whether operating as a unit or in sections it procures or stocks practically all medical, dental, and veterinary articles of medical supply that are authorized for the units of a field army. As field armies are mobile, the supplies maintained in army depots are ordinarily limited in character and amount to those essential to maintain combat efficiency for a period not exceeding three days. The articles actually stocked by army medical depots are therefore those that require frequent replenishment. An army depot requisitions supplies through the army sur-

geon and regulating office, from a designated communications zone depot, and the supplies are received therefrom through the regulating officer. The depot issues direct to army establishments (evacuation hospitals, etc.) and issues to the headquarters and service companies of army medical regiments and to the headquarters detachment of corps, and division medical battalions who in turn issue to organizations served by them. Units drawing supplies from an army depot ordinarily send their own transport for them. Army medical depots must therefore be located on a railroad line leading from the rear and on good roads leading to the front. They are usually established near evacuation hospitals or in rear thereof at central points in the road net of the army service area.

A *corps medical park* is a temporary expedient utilized when a corps is acting independently. Ordinarily, it will be operated by the headquarters detachment (reinforced or otherwise) of the corps medical battalion. The supplies carried will usually be limited to the capacity of the available transport. When a corps is heavily reinforced and has a number of evacuation hospitals and surgical hospitals attached or is operating in an entirely independent campaign, the corps medical park may be operated by a portion of an army medical depot.

Medical supplies for a corps medical park are obtained through the army medical depot or obtained direct from a designated communications zone depot through the regulating station.

Medical supply sections of the headquarters and service company of the army medical regiments serve the component units of their respective regiments and the medical detachments of the army troops. The medical supply sections of the headquarters and headquarters detachment of the corps medical battalion serves the component units of the medical battalion and the medical detachments with corps troops. Likewise the medical supply section of the headquarters and headquarters detachment of the division medical battalion serves the component units of the medical battalion and the medical detachments of the division troops. As these units are mobile and as transportation is always a controlling factor, the supplies carried consist of those items of field medical supplies authorized for these troops that are likely to require frequent replenishment. All medical supply sections ordinarily replenish their medical supplies from the army medical depot. Division medical supply sections in an independent corps obtain them from the corps medical park.

Regulating stations. The regulating station intervenes between the communications zone depots and the army medical depots. It is the agency in the system of supply distribution for the area or army it serves. As explained in the section on "Hospitalization and Evacuation," each regulating station has a medical group attached. This group is responsible for the systematic, orderly movement of the medical supplies to organizations served by the station and for the evacuation of men and animals therefrom. The group should be advised in ample time of proposed changes at the front that affect medical supply operations and make appropriate dispositions accordingly. They make suitable drafts for supplies on designated depots in rear to insure the necessary flow of supplies. Shipments are not forwarded to any regulating station, nor to any point in the zone of the armies served by such station, except by order of the regulating officer or in accordance with a definite shipping schedule previously approved by him. Officers commanding medical sections of depots and others in charge of shipments are responsible that advance notice is given the medical regulator of all shipments made to his regulating station. Medical supplies for an army are ordinarily sent by the regulating officer to the army medical depot in carload lots although less than carload lots are forwarded when necessary. The army medical depots then make all distributions within the army. This method is particularly desirable in combat where speed in supply is important. The rule is not inflexible, however. Supplies may be sent directly from communications zone depots to evacuation hospitals, convalescent hospitals, or other large units, located at railheads. Carload lot shipments may be thus expedited. Less than carload lot shipments are only sent in this manner when speed in supply is not of great importance, that is when troops are out of contact with the

enemy or are in stabilized or semistabilized warfare. If this latter method is used, it is necessary that all such supplies be requisitioned through the army medical depots and the delivery acknowledged to the latter, even though the supplies do not pass physically through the army medical depots.

Medical Department Central Control. Successful supply coordination is dependent upon a well organized supply section in the office of the surgeon of the communications zone, for upon this machinery rests the responsibility for the execution of all policies and plans for storage and distribution of medical supplies for the field force. The major portion of medical supplies will come by automatic shipment from the zone of the interior; there must, therefore, be on file in this office duplicates of all automatic schedules of supplies and equipment released from depots in the zone of the interior for shipment to the theatre of operations. Provision must be made for ready modification of the amount of the constituent items of the automatic supply unit in order to meet the changing needs of the forces in the theatre of operations. The supply division, Surgeon General's office, is entirely dependent for its information relative to the supply situation in the theatre of operations upon the data prepared by the surgeon, communications zone. There must, therefore, be established a close reciprocal liaison between these two agencies. The Army surgeon is entirely dependent for his replacement upon the depots of the communications zone. The supply division of the office of the surgeon, communications zone, must therefore have at all times an accurate knowledge of what is required by the armies, what is available in storage, and what supplies are in transit.

Medical supply reports. In the early development of communications zone activities, depots are established. These depots should send to the surgeon, communications zone, *periodical and special reports* covering the following:

<i>Stock</i>	Issued
	Remaining
<i>Space</i>	Utilized
	Available
<i>Car movement</i>	Into depot
	Out of depot

The information thus received is used as a basis for the office charts and graphs of the supply division. Data with reference to stock issues will be used in the study of usage factors and in connection with the modification of the automatic schedules referred to above. Consolidated stock balance reports serve as distribution sheets for the equalization of stock in depots. That is, issues or distribution of stock to depots are made in reports of expenditures.

All details of storage space within depots must be available for ready reference. This data should cover storage space authorized, provided, utilized, and vacant.

Distribution of Medical Supplies. The responsibility of the communications zone surgeon for the distribution of medical supplies extends from the base depots into the combat zone, but this responsibility ends with placing the supplies at the regulating station. Ultimate distribution within the combat zone is a responsibility of the Army surgeon.

Methods. Distribution is effected by two methods.

Distribution on requisition is the routine peace-time method and is also the old established method used in war and the one that is emphasized in *FM 100-10 Field Service Regulations (Administration)*. It is particularly applicable to small units, to front line troops, and to short lines of communication. Its chief advantage is that it is specific and, when successfully executed, results in the exact supplies required being received by the unit when needed. Its chief disadvantage is that, with the size and complexity of modern forces, the distance at which they may operate from their bases, and the rapidity of movement demanded, times does not suffice.

Distribution by the establishment of credits is a method utilized to cut the time and effort of requisition. This method makes definite quantities of supplies in storage available to the commands to which allotted. The latter call directly on the designated

depot for their shipment. It is particularly applicable to the supply of larger units with items the need for which can be foreseen but for which the time or place of demand are indefinite. Time may be too short and space may be too great for the greatest efficiency, and the method requires supplies in such quantity that they can be earmarked and held available. Supply by this method is meeting with increasing favor where it is applicable.

Requisitions. The requisition method of obtaining supplies will generally be used for the distribution of medical supplies from the various depots to the units that are to use the supplies. During combat operations, these requisitions will often be informal. Requests are normally filled from supplies actually on hand or at the disposition of the various headquarters. Only under exceptional circumstances will requests be forwarded for action to higher authority while subordinate agencies still have supplies at their disposal from which such requests may be filled. In such cases the reason for forwarding the requests to higher authority will be indicated. When a depot cannot supply all articles called for on a request it forwards such articles as may be available and notifies the surgeon, communications zone, by telegraph as to the unfilled portion of the requisition. The surgeon should direct another depot to forward direct to the requisitioner the supplies necessary to fill the requisition. The surgeon, communications zone, when authorized by the commanding general of that zone, may keep the entire stock of certain classes of articles of which the supply is limited at one or more designated depots; in such a case other depots will forward thereto their requests for these supplies.

In general, when it is known that items cannot be supplied within fifteen days after receipt of requisition by the supply agency concerned, they should be stricken from the request and the officer initiating the demand should be notified at once. *Arrearages* on requests are not allowed to accumulate. Prompt action on every request must be taken, within the limits of his power, by each officer through whom a requisition passes.

Organizations will not make duplicate requests for articles which they have called for on previous requests until they have received notice that such articles have been stricken from previous requests; provided, however, that:

Supply officers may at intervals of not less than fifteen days include in requests all items previously requested and not supplied, but they will indicate opposite each such item the number of times and the dates and reference numbers of the requests on which it has been previously stricken out. A reasonable period must be allowed for transmission of requirements and for delivery of supplies.

Within the combat zone during active operations, all medical units send their requisitions direct to the medical supply unit which normally supplies them. At other times they send them to their respective headquarters.

Credits. Specified quantities of medical supplies stored in depots in rear of the army may be allotted to and placed at the disposal of the army surgeon for a definite period of time. Such quantities of supplies are called "credits," and after allotment are subject to draft on demand direct from any headquarters without further reference to GHQ or the communications zone. The credit method of distribution is advantageous in supplying army medical depots during combat operations. The purpose of allotting such credits is to assure the army of a definite amount of medical supplies for the period stated and at the same time relieve the army of the necessity of caring for them in army medical depots. The commanding officers of the depots at which stores are actually located thus become warehousing agents for the army for the amount of medical supplies covered by the credit allotment. Upon receipt of drafts from army headquarters for supplies covered by "credits," the commanding officer of a depot arranges through the proper regulating officer for necessary transportation and causes cars to be loaded by the medical depot officer. One copy of each draft made against the credit will be sent by army G-4 to the regulating officer. By arrangement between army G-4 and the regulating officer, the orders may direct shipment in carload lots at a fixed rate for a number of days. At the end of the period named in the credit allotment, all undrawn balances revert to depot stock; but, on request made prior thereto, a new credit will have to be arranged by head-

quarters of the field forces (G-4) for the next succeeding period. The army surgeon may, at his discretion, make similar credit allotments of supplies in army medical depots to subordinate units and establishments.

Method of Supply Within the Communications Zone. Medical units within the communications zone obtain their supplies in the following general manner, details of which are prescribed by the surgeon, communications zone.

All articles of ordinary medical supply needed by an establishment are issued by a previously designated supply depot on requests approved by local commanders and sent direct to the depot. Requests for exceptional supplies are submitted to the surgeon of the communications zone who, after approval, sends them to the proper depot for filling.

In authorizing credits and making drafts on depots for supply of medical units in the communications zone, the surgeon of the communications zone must use due care to protect the interest of the troops in the combat zone.

Copies of orders and general instructions in regard to medical supplies distributed by the surgeon of the communications zone should be forwarded to the headquarters communications zone to GHQ for information and file. It is a function of the chief surgeon at general headquarters to review such publications in order to insure that the general supply policies are maintained and that supplies are distributed in conformity with the strategical situation.

American Red Cross, Supply Function. The American Red Cross constitutes a part of the medical service in war. This is the only civilian relief organization authorized to procure and distribute medical supplies for use of the army. This procurement and distribution, whether at home or abroad, must be carefully coordinated with military needs if useless expenditure of money and needless duplication of effort are to be avoided.

"It is not intended that the Red Cross shall duplicate or parallel the work of the War Department in the procurement and distribution of medical supplies. Standard medical supplies procured by the Red Cross shall be held as a reserve to meet unforeseen emergencies or to supplement standard medical supplies in grave situations. Ordinarily, special or nonstandard medical supplies furnished by the Red Cross should be turned over in bulk to the Surgeon General to be distributed by his agencies. The Red Cross may procure and issue certain nonstandard and less essential remedial supplies when the military situation permits, provided such supplies cannot be obtained through the usual channels." (Par. 9b, AR 850-75.)

The supply activities of the Red Cross operating with a field force should be limited to supplying those items not furnished as standard supplies by the Medical Department, and distribution thereof should be controlled by the Medical Department. Red Cross supplies for a field force should be furnished upon a definite basis and in accordance with a well-balanced procurement plan which keeps pace with the progressive increases in strength of the force. This can only be accomplished as a result of a well-coordinated study of the needs carried out by supply representatives of the Medical Department and the American Red Cross. To assure this coordination within the theatre of operations, it is desirable that a Red Cross representative be assigned to the supply section of the office of the surgeon, communications zone.

SANITATION IN THE THEATRE OF OPERATIONS

Definition. The term military sanitation when used in its broadest sense includes all measures employed to prevent or control infectious diseases, and to conserve the health or to maintain or increase the physical fitness of military personnel. The procedures, measures, or activities included in military sanitation may be classified as environmental sanitation, epidemiology, physical examinations and physical inspections, and personal hygiene.

Medical Department Responsibility. Generally, the Medical Department is responsible to higher authority for investigating, reporting upon, and making recommendations pertaining to all phases of military sanitation. Specifically, the Medical Department is charged with the supervision, in an inspectorial and advisory capacity, of environmental

sanitation, with the conduct of epidemiological investigations or studies, with the performance of all physical examinations and inspections, and with studying and making recommendations pertaining to measures which will protect or promote the physical fitness of the individual soldier.

Administrative Responsibility and Control. The administrative control of sanitation is exercised by organization commanders of all grades who are responsible for sanitation within their commands. Sanitary measures are executed by the personnel of the organization concerned or by special troops. Except in Medical Department organizations, Medical Department personnel does not execute sanitary measures, other than those involving professional activities, such as physical examinations, immunizations or the operation of laboratories.

Principal Factors in the Sanitation of a Theatre of Operations. The basic principles of sanitation in the theatre of operations are the same as those obtaining in the zone of the interior, but the methods employed in their application are modified by differences in the disease resisting characteristics of the personnel, by changes in environmental factors, by the nature of the military mission and operations, and by the facilities available.

During the mobilization and training period in the zone of the interior, the control of infectious diseases introduced by cases or carriers entering the army from civil life and the rejection or elimination of the physically unfit by means of physical examinations and inspections are of paramount importance and constitute the principal features of military sanitation. A newly mobilized military force possesses a relatively high degree of group susceptibility to infectious diseases but, on the other hand, effective environmental sanitation as a means of controlling the spread of these diseases can be more easily maintained in the zone of the interior than in the theatre of operations.

In a theatre of operations, the introduction of infection into a military force from outside sources is minimized by the absence of extensive or numerous contacts between the troops and a civilian population. Further, troops in a theatre of operations may normally be expected to be more resistant to infection, especially some of the respiratory diseases, than recently mobilized men. Epidemics in mobilization and training camps have served to increase the group immunity to certain diseases by increasing the number who have had these diseases or who have had repeated contacts with sources of infection. The resistance of the group to all diseases is further augmented by the physical training incident to military training and by the elimination of physical defectives. However, cases and carriers remain among the members of the forces and constitute sources of infection. Also, the more primitive environment in a theatre of operations, and frequently the character of military operations, render it more difficult to protect the troops from environmental sources of infection or to control or remove these environmental factors which serve to spread disease. Consequently, under the usual conditions, military sanitation in a theatre of operations is principally concerned with: *first*, the prevention of disease spreading from sources, such as cases or carriers within the military forces; and *second*, with environmental sanitation.

Plan of Sanitation for a Theatre of Operations. Any complete plan for military operations in a given theatre of operations includes provisions for protecting the health of the troops. A special war plan should, and usually does include a definite sanitation plan which provides for all sanitary measures of a general nature as well as for those special disease control procedures, the need for which can be anticipated. A plan of sanitation which forms a part of a special war plan is based on a study of health conditions existing in the theatre in question and of the character of the troops, with regard to the length of service and training, which will be sent to this particular theatre of operations.

As the factors of health significance vary greatly in importance in different theatres of operations, the special disease control procedures which may be provided for in different plans will likewise vary considerably. Thus, the season of the year, the nature of the diseases that are epidemic or endemic among the civilian populations in a particular theatre, or troop movements which will result in abnormal crowding may necessitate the formulation of plans for special procedures to control a particular disease or groups of diseases. In one theatre it may be expected that respiratory diseases will predominate while in another an insect borne disease may be the most prevalent.

Principal Features of Sanitation in a Theatre of Operations. Given a type theatre of operations, consisting of a communications zone divided into sections and a combat zone, the health problems presented in one portion of the theatre will differ to some extent from those encountered in another part of the same theatre.

Communications zone. The communications zone is primarily a zone of concentration and movement. If the zone is deep and troops must be transported for long distances by railroad, the crowding incident to troop movement in railway cars promotes the spread of diseases transmissible by contact and by lice.

The evacuation from the combat zone of those sick with communicable diseases together with the constant arrival of carriers and mild or early cases from the zone of the interior tends to concentrate sources of infection in the communications zone.

In the base section of the communications zone the health conditions are similar to those of the zone of the interior. Conditions are usually sufficiently stable to permit the execution of sanitary measures by agencies operating directly under the control of section headquarters, rather than by subordinate units. Thus, water supply systems of a permanent or semi-permanent character are usually installed and operated by the section engineers of the Engineer Corps. The operation of delousing facilities, waste disposal agencies or systems is a function of section headquarters or of organizations attached to those headquarters, and not of the individual units concentrated in or passing through the base section.

Diseases transmissible by indirect contact, especially the respiratory diseases, constitute the most serious health problem in the typical base section. Troops arriving from the zone of the interior bring with them carriers and cases of disease which serve as sources of infection. The carriers may be chronic or temporary carriers of such diseases as diphtheria or epidemic meningitis. Mild cases which have not been isolated, cases in the incubationary stage, or missed cases among troops who have recently arrived in the theatre of operations frequently constitute sources from which epidemic disease may spread.

The concentration of large numbers of troops in a base section, where housing facilities are frequently inadequate, will almost inevitably result in crowding. These conditions in the presence of sources of infection render it necessary that adequate measures be taken to control those diseases which are transmissible by indirect contact, such as the respiratory diseases.

In the advanced section of a communications zone, the health problems encountered differ from those of the base section only in that the environmental sanitation must to a greater extent be accomplished by the units concerned. As a rule, the incidence of intestinal diseases increases, due not only to a greater number of uncontrolled local agencies of transmission, particularly water supplies and food, but also to cases evacuated from the combat zone.

The combat zone. In the combat zone the control of communicable diseases is accomplished mainly by the early detection and evacuation of cases and carriers and by such control of transmission agencies as military operations will permit. Usually, the control of intestinal and insect-borne diseases present the greatest difficulty. The purification of the water supply, either by Engineer Corps agencies or by the using organizations, protection of the food supply from contamination, and delousing where louse-borne diseases are present, are usually the most important of the measures employed to prevent the transmission of disease among the troops in the combat zone.

Organization for Sanitation. *General headquarters.* The chief surgeon of a theatre of operations at GHQ formulates and recommends to the commanding general of the forces general policies pertaining to the prevention of disease and the conservation of health among the military personnel in the theatre of operations. If conditions are such that civilian populations are brought under military jurisdiction, the chief surgeon also prepares policies relative to such public health measures as may be required to protect the health of the civilian inhabitants.

In a typical theatre of operations, the chief surgeon does not directly supervise the execution of disease control measures. He is concerned only with general policies and

delegates to the lower echelons all Medical Department activities pertaining to the supervision or prosecution of sanitary measures under such policies. He coordinates sanitation in the combat zone and the communications zone through the GHQ staff and by contact with the army surgeon, or surgeons, and the surgeon, communications zone.

The communications zone. The surgeon, communications zone, supervises and directs the sanitation of the communications zone. He has a medical inspector who, with his assistants, inspects and makes recommendations relative to all activities in the field of sanitation in the communications zone.

In situations where the communications zone is divided into sections, the surgeon of the communications zone may, and as a rule does, delegate to the surgeon of the various sections responsibility for the immediate supervision of sanitation within their respective sections. He continues, however, to exercise general supervision over and to be responsible to the commanding general, communications zone, in a staff capacity, for the sanitation of the entire zone.

The principal medical laboratory installations employed in the conduct of epidemiological studies and in the execution of disease control procedures are the medical general laboratory and the communications zone laboratories. Hospital center, general hospital, and station hospital laboratories, though primarily organized and equipped for clinical work, may also be employed in the conduct of analyses and studies connected with disease control, especially where such activities relate to commands served by these hospitals.

The combat zone. The army surgeon, or surgeons, if the combat zone is occupied by two or more armies, under the chief surgeon, GHQ, through the staff and commanding general of the army, supervises the sanitation of the combat zone. The army surgeon is directly concerned with all sanitation activities in the area occupied by the army. Corps and division surgeons are responsible for the supervision of sanitation within the commands to which they are assigned and the areas occupied by those commands in conformity with sanitary orders issued or policies promulgated by army headquarters through corps or division headquarters.

In a type army, sanitation of the army area is, to a large extent, supervised directly by army headquarters. To accomplish this function the army medical inspector and his assistants, under the army surgeon, make sanitary inspections, conduct epidemiology surveys or studies, or make such other investigations as may be required throughout the entire army area. They may also assist in or direct the health activities of the corps and divisions of the army, especially with regard to environmental sanitation.

The laboratory facilities which the army surgeon has at his disposal for employment in the conduct of health measures consist of the army laboratory and the dispensary laboratories of the medical regiments. The laboratories of the evacuation and surgical hospitals, like the hospital laboratories of the communications zone, are organized and equipped for clinical work. They may, however, under unusual conditions, or more particularly where the commands they serve are directly concerned, be utilized for the performance of epidemiological work.

Laboratories of the Theatre of Operations. The medical general laboratory and the army or communications zone laboratories are organized, staffed, and equipped primarily for the conduct of epidemiological studies and other laboratory functions pertaining to the control of communicable diseases.

The medical general laboratory (T/O 8-610). The medical general laboratory is a fixed installation in the communications zone and operates under the direct control of the surgeon of the communications zone. There is normally but one medical general laboratory in a typical theatre of operations. As far as practicable, it is established permanently where adequate facilities for extensive laboratory work are available and at a point which is centrally located from a service viewpoint. Its principal function is the general technical supervision of epidemiological work throughout the theatre of operations with a view to obtaining uniformity of methods and to establishing adequate control of disease. Specially trained individuals or groups may be sent from the laboratory to various parts of the theatre of operations for the purpose of making

epidemiological investigations or assisting in the control of some particularly difficult disease situation.

The Medical General Laboratory conducts research studies pertaining to disease control problems encountered in the theatre of operations. It distributes pertinent technical literature on disease control and laboratory methods. It may also supply, and, where necessary, manufacture biological products of a special nature.

	1	2	3	4
	Unit	Technician grade	General laboratory	Remarks
2	Colonel.....		1	
3	Lieutenant colonel.....		(a 1 b 1) e 4	a May be Sanitary Corps.
4	Major.....		(a 2 d 1) e 5	b Veterinary Corps.
5	Captain.....		(a 4 b 1 f 1) e 7	c Includes—
6	First lieutenant.....		(a 6 f 1) e 8	1 epidemiologist.
7	Second lieutenant.....		f 1	1 pathologist.
8	Total commissioned.....		26	1 sanitary engineer (Sanitary Corps).
9	Master sergeant, including.....		1	1 bacteriologist and pathologist with special training in laboratory examination of food (Veterinary Corps).
10	Technician, laboratory (411).....		(1)	d Dental.
11	First sergeant (585).....		1	e Includes—
12	Technical sergeant, including.....		3	1 serologist.
13	Technician, laboratory i (411).....		(1)	1 bacteriologist—pathologist (Dental Corps).
14	Technician, laboratory i (411).....		(1)	1 chemist with special training in biochemistry, water chemistry, and toxicology (may be Sanitary Corps).
15	Technician, laboratory k (411).....		(1)	1 bacteriologist—epidemiologist.
16	Staff sergeant, including.....		2	1 entomologist (may be Sanitary Corps).
17	Duty (566).....		(1)	f May be Medical Administrative Corps.
18	Mess (824).....		(1)	g Includes—
19	Sergeant, including.....		2	1 serologist (may be Sanitary Corps).
20	Duty (566).....		(1)	1 pathologist (photography and collection of specimens).
21	Supply (821).....		(1)	1 bacteriologist (may be Sanitary Corps).
22	Corporal, including.....		2	1 chemist (may be Sanitary Corps).
23	Duty (566).....		(2)	1 office executive (may be Medical Administrative Corps).
24	Technician, grade 3.....		7	1 parasitologist (may be Sanitary Corps).
25	Technician, grade 4.....		15	1 bacteriologist—pathologist, with special training in the laboratory examination of foods (Veterinary Corps).
26	Technician, grade 5 including.....		19	h Includes—
27	Private, first class.....		20	1 sanitary engineer (may be Sanitary Corps).
28	Private.....		29	1 entomologist (may be Sanitary Corps).
29	Chauffeur (344).....		(1)	1 serologist (may be Sanitary Corps).
30	Clerk, general (065).....		(1)	3 bacteriologists (may be Sanitary Corps).
31	Clerk, typist (405).....	5	(1)	i supply and transportation officer (may be Medical Administrative Corps).
32	Clerk, typist (405).....		(2)	j clinical pathologist.
33	Cook (060).....	4	(2)	k Trained in bacteriology.
34	Cook (060).....	5	(2)	l Trained in pathology.
35	Cook's helper (521).....		(3)	m Trained in serology.
36	Driver, light truck (345).....	5	(1)	n Includes—
37	Driver, light truck (345).....		(7)	2 trained in medical biology.
38	Laboratory helper (521).....		(8)	1 trained in veterinary laboratory work.
39	Mechanic, motor (014).....	4	(1)	1 trained in field sanitation.
40	Orderly (695).....		(7)	1 trained in bacteriology.
41	Stenographer (213).....	4	(1)	1 trained in pathology.
42	Technician, laboratory (411).....	3	((b 1) 7)	1 trained in serology.
43	Technician, laboratory (411).....	4	((b 2) 11)	o Includes—
44	Technician, laboratory (411).....	5	((b 2) 15)	1 trained in medical biology.
45	Technician, laboratory (411).....		(11)	1 trained in veterinary laboratory work.
46	Basic (521).....		(9)	1 trained in field sanitation.
47	Total enlisted.....		101	1 trained in bacteriology.
48	Aggregate.....		127	1 trained in pathology.
49	Q Truck, 1/4-ton.....		6	1 trained in serology.
50	Q Truck, 3/4-ton, carry-all.....		1	p Includes—
51	Q Truck, 3/4-ton, weapon carrier.....		1	1 trained in veterinary laboratory work.
52	Q Truck, 2 1/2-ton, cargo.....		1	1 trained in field sanitation.

Plate 18. T/O 8-610, April 1, 1942. Medical General Laboratory.

Medical laboratories Army or communications zone (T/O 8-611). (See Chapter IV.) The army or communications zone laboratories are classed as mobile installations. They are smaller than a medical general laboratory and can be more readily moved and re-established to meet the demands of changing military or disease situations. These laboratories are operated under the direct control of the surgeon, communications

zone, or direct control may be delegated to a section surgeon. If in an army area, they may be under the control of the army surgeon.

An army or communications zone laboratory is primarily an epidemiological laboratory, and its principal functions are the investigation of epidemic conditions and the performance of routine laboratory analyses in connection with the control of communicable diseases.

	1	2	3	4	5	6	7
1	Unit	Technician grade	Company headquarters	2 platoons (each)	Total	Enlisted cadre	Remarks
2	Captain		a 1		1		
3	First lieutenant			b 1	1		
4	Second lieutenant				1		
5	Total commissioned		1	1	3		* Medical Medical Corps, Administrative Corps, or Sanitary Corps. b Medical Administrative Corps.
6	First sergeant (585)		1		1	1	
7	Staff sergeant, including			1	4	2	
8	Mess (824)		(1)		(1)	(1)	
9	Platoon (651)		(1)	(1)	(2)		
10	Supply (721)		(1)		(1)	(1)	
11	Sergeant, including			2	4		
12	Section leader (652)			(2)	(4)		
13	Corporal, including		1	3	7	1	
14	Company clerk (405)		(1)		(1)	(1)	
15	Section leader (652)			(3)	(6)		
16	Technician, grade 4				1	1	
17	Technician, grade 5				3	2	
18	Private, first class		11	44	42		
19	Private				53		
20	Carpenter, general (050)	5	(1)		(1)		
21	Cook (060)	4	(1)		(1)	(1)	
22	Cook (060)	5	(1)		(1)	(1)	
23	Cook's helper (521)		(2)		(2)		
24	Mechanic, general (121)		(2)		(2)		
25	Orderly (695)		(1)		(1)		
26	Technician, sanitary (196)	5	(1)		(1)	(1)	
27	Technician, sanitary (196)		(1)		(1)		
28	Unrated (521)			(39)	(73)		
29	Basic (521)		(1)	(5)	(11)		
30	Total enlisted		15	50	115	7	
31	Aggregate		16	51	118	7	

Plate 19. T/O 8-117, April 1, 1942. Medical Sanitary Company.

Coordination of Sanitation Activities. The chain of responsibility for the technical supervision of all activities affecting the health of the troops in a theatre of operations passes from the chief surgeon at GHQ to the surgeon, communications zone, and from the chief surgeon to the army surgeons. If there are communications zone sections, each section surgeon is responsible to the surgeon of the communications zone. The division surgeons are responsible directly to the army surgeon. The corps surgeons are responsible to the army surgeon for those activities which concern the corps troops, but they do not normally supervise the sanitation of divisions belonging to their corps.

Administrative responsibility for sanitation coincides with command, and commanders of all grades are responsible to the commanders of the next higher echelon for sanitation within their commands, except that division commanders are normally responsible to the army commanders rather than to the corps commander.

Military sanitation is accomplished by administrative action through the proper military authority, which is in turn based on the technical advice and recommendation of the surgeon of the command concerned. The surgeon of a command discharges his respon-

sibility for the technical supervision of sanitation principally by recommendations to his commanding officer. These recommendations are based on the results of inspections or studies made by the surgeon or by such of his subordinates as the medical inspector, laboratory personnel, or the surgeons of subordinate commands.

Administrative action is obtained by the issue of orders or instructions by the proper military headquarters. In the case of the small units, such as a division or a fixed installation, all routine sanitation matters are usually provided for by a sanitary order issued by the commanding officer. The commander of such a unit, or his representative, may provide for special sanitary measures by special or administrative orders, circulars, or memoranda of instructions or by informal verbal or written instructions.

In the higher echelons, such as the communications zone, sections of a communications zone, or an army, action with regard to sanitation is normally controlled by means of circulars, bulletins, letters, or memoranda of instructions issued to the lower echelons of the command concerned.

CHAPTER VI

TRAINING OF MEDICAL UNITS

Purpose of Military Training. The ultimate purpose of all military training is the assurance of victory in war. Specifically, at this time, our objective is to defeat the Axis powers. Our army must be trained to do its job in an effective manner if it is to accomplish this result with the least possible losses to our country. Next to the actual conduct of active military operations, training is the greatest consideration of our army. The effectiveness of our fighting forces when they meet the enemy will depend upon the degree of our training.

Attached medical personnel and Medical Department units must be prepared to support the offensive spirit and actions of the armed forces. This is true not only for such organizations as medical regiments, medical battalions and medical detachments attached to subordinate units of the arms and services, but also for all medical establishments extending from the combat zone into the zone of the interior. Units must be trained to function effectively in any type of war. The well trained medical unit will increase the offensive spirit by assuring the combat personnel of adequate medical service at all times.

Therefore, the medical personnel like the troops of the combat forces must be trained to be aggressive, resolute, and thoroughly capable. This training begins in the replacement training centers. From the replacement training centers troops are sent to specialist schools and to units of the arms and services where these skilled individuals develop teamwork in the execution of military missions for the organizations which they serve. Finally, these medical organizations as part of units of the separate arms and services must be developed to serve divisions, army corps, and field armies. In this training they must develop teamwork with all the agencies of the ground forces, services of supply, and air forces. The basis of initial training is the individual, but the ultimate requirement is teamwork from the smallest unit to the largest.

Analysis of the Training Process. *Field Manual 21-5, Military Training*, prescribes training doctrines, principles, methods, and management for all components of the Army. A point which stands out after study of this important document, is that the principles of training of individuals of each arm and service, and of each component of the Army of the United States is essentially identical. The qualities to be developed in the individual or unit are the same for all. Differences in training are confined to special subjects relating to *tactical* and *technical proficiency*. Medical Department soldiers like enlisted men of other arms and services must be good soldiers and they must have the same high standard of *discipline; of health, strength and endurance; of morale, initiative and adaptability*, and they must have the same fine *leadership* in order to produce the final goal of *teamwork*. Pride in an individual's organization and pride in his own small unit are desirable qualities which should be encouraged by officers. Such pride is engendered chiefly by the accomplishments of a unit and of individuals in the unit. It cannot be acquired by command. However, an officer may, and should, direct the attention of his men to the value of their organization to the military service. Recalling to the minds of the men the various experiences held in common by members of the unit is a valuable approach to pride in organization.

Care must be taken that pride fostered in a unit does not degenerate into considering the unit to be the only vital military organization. Each organization has certain particular duties, produced by its own special training. Each organization has a definite role to play in the functioning of the entire army. The interdependence of all units should be stressed by all officers. The war will be won by proper coordination of all branches of the service. Pride must be directed in a manner which encourages the conviction among the troops that every branch is equally important, and that their branch and their own units will not fail in their duties. Each unit must be placed in the proper perspective as regards the whole military service.

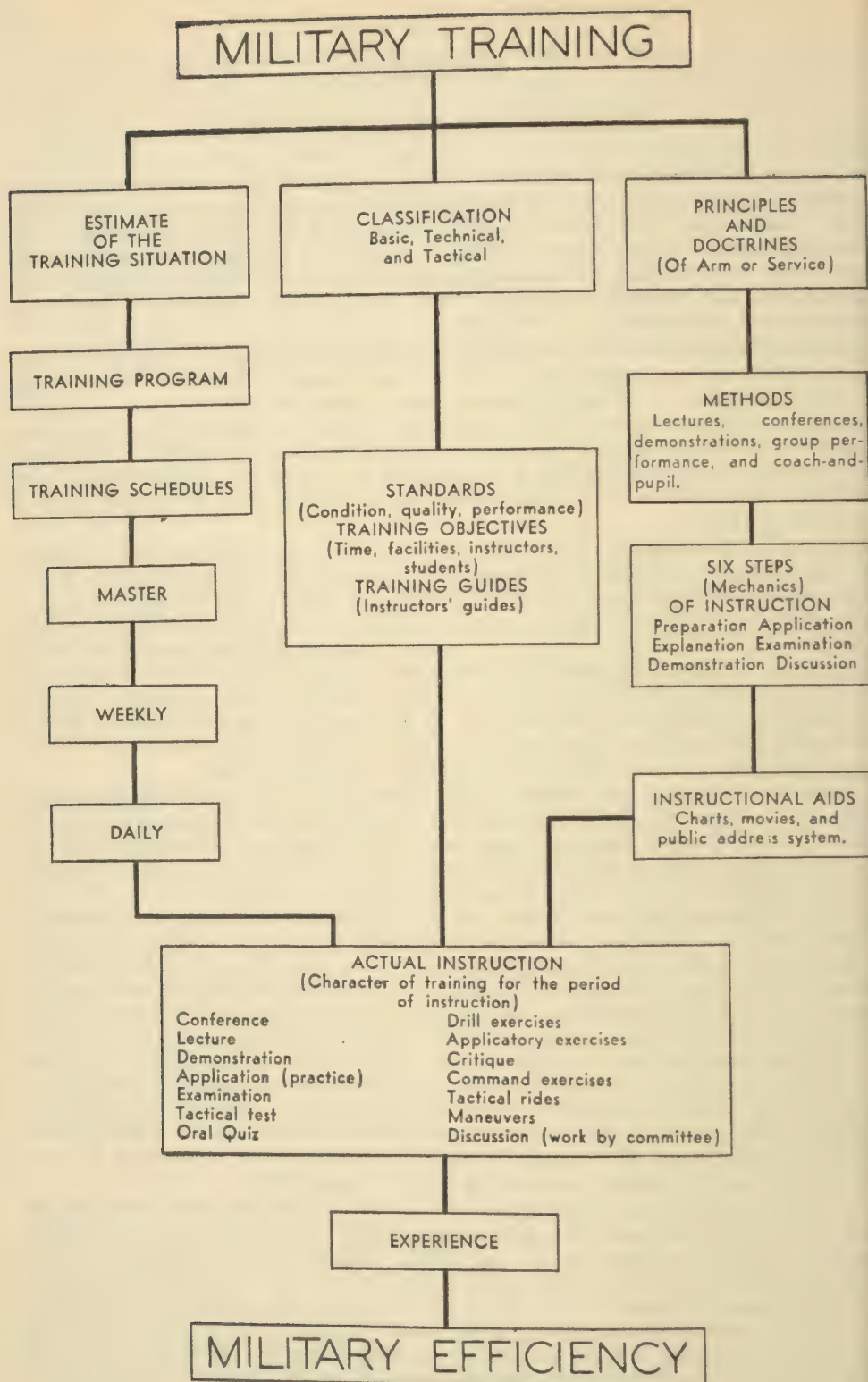


Plate 1. Elements of the Training Process.

Responsibility and Direction of Training. Training management is a function of command and, therefore is the responsibility of every unit commander. The direction of training to secure uniformity and cooperation of effort is exercised through the established chain of command from the highest to the lowest headquarters. The announcement of policies and doctrines, assignment of training objectives, allotment of time and means and the promulgation of plans for the training of individuals and units are accomplished through the medium of training orders.

Training orders, issued as training directives, general orders, mobilization regulations, administrative letters and training circulars are usually issued by higher headquarters. Training programs and schedules embody the more detailed training plans of tactical commanders down to and including commanders of companies and similar units. The training plan results from the estimate of the training situation and is announced in training programs and schedules.

TRAINING PROGRAMS AND SCHEDULES

Estimate of the Training Situation. The higher headquarters prescribe the training objectives, allot the use of facilities to units in turn, and designate the periods for maneuvers and tactical exercises. The commander of a subordinate unit must make a careful analysis of the objectives to be met, the steps required to attain each objective, survey his own problem with reference to the existing state of training of his unit, determine the facilities which will be required, and make detailed plans for the best use of the time which is available to him to execute all his missions. The following factors are considered in an estimate of the training situation:

1. *Mission (Training objective)* (stated in directives of higher headquarters)
2. *Essential subjects* (given in MTP 8-1)
 - (a) *Basic* (common to all soldiers)
 - (b) *Technical* (specifically related to the particular unit)
 - (c) *Tactical* (movement of the unit, inc. maneuvers)
3. *Time available* (from higher Hqs., first and last dates of training period)
4. *Equipment and facilities available* (instructional aids which are available, buildings and grounds which may be used)
5. *Personnel available as instructors* (an analysis of the officers who are to conduct training; their qualifications, military and civilian experience, temperaments, etc.)
6. *Local conditions*
 - (a) *Climate*, (b) *Terrain* (an estimate of conditions and their effects on training)
7. *Existing state of training* (what military experience, or what civilian experience of military value have the men had?)
8. *Organization for training* (a breakdown of the unit into its component parts for specialized training according to particular functions to be performed)
9. *Obstacles*
 - (a) *Administrative* ("housekeeping" duties which interfere with training of all personnel) such as—
 - (b) *Physical* (lack of buildings and grounds)
 - (c) *Human* (personal and emotional problems of officers and men, changes in environment of newly recruited men, various fears and misgivings.)

After the commander has made the estimate and arrived at a plan he is ready to promulgate his plan in orders, and then which are issued as a training program in a schedule which may well include delegation to subordinate leaders the task of conducting phases of the training process. The next and final step is that of carrying out the plan by execution in which the commander must supervise the instruction given by others to make very certain that it is given correctly and that it will be completed satisfactorily within the available time.

Training Program. The estimate of the training situation results in the development of the training program and the training schedules. There is no prescribed form for training programs. Every officer who prepares such a document must be guided by the training project for which the training program is provided. Completeness, logical

sequence, and clarity are the essential features of a good training program. The following form is suggested for a medical unit: (also see FM 21-5).

UNIT TRAINING PROGRAM

1. *Place and Date of Issue with Introductory Remarks:*
Training Memorandum
No. 1

.....
(unit)

.....
(station)

.....
(date)

The following regulations governing the training of Co., Med. Bn. during the period to, are published for the information and guidance of all concerned.

2. *Mission:* A concise explanation of the training requirements and expectations, with a time limit set for attaining proficiency in the various subjects.

3. *Scope of the Course:* An explanation of the division of the course into basic, technical and tactical subjects with note of the approximate number of weeks to be devoted to each group of subjects.

4. *Allotment of Time:* A statement of the length and limits of the training day, the duration of the training hour, and the days on which training will be scheduled.

5. *Subjects to be Taught:* Taken from MTP 8-1 and slightly modified as necessary to fit the situation of the particular unit.

6. *Distribution of Training Duties:* A listing of subjects with designation by name of the officers assigned as instructors. Consideration must be given to the abilities and professional knowledge (military and civilian) of officers assigned to instruct.

7. *Methods of Instruction to be Employed:* The specific methods to be used should be designated and, in general, should be chiefly applicatory in character. Attention should be directed to training films and to types of examinations or quizzes to be given.

8. *Coordination in Use of Training Facilities:* A designation of any limitations imposed by higher authority in the use of particular facilities. Days and hours when facilities are available should be stated here.

9. *Coordination of Training and Administrative Duties:* Designate men who have had basic training to carry on routine duties to relieve the new enlisted men from such duties until they have received the first two weeks of basic training.

10. *Schools:* A designation of schools for officers and for noncommissioned officers, with days and times for classes stated.

11. *Plan for Training of Specialists:* An announcement of the number of enlisted men to be sent to the several army schools for training technicians, as well as specialist schools conducted by the unit itself. Designation should be made of the particular specialists to be trained.

12. *Date effective:*

By order of

Distribution:

Master Schedules. Master schedules are submitted to the next higher commander for revision or approval. They are entirely tentative and must be so considered.

The master schedule is merely a budget of hours issued in tabular form. It shows the training subjects, and hours for each subject allocated by training weeks. Of necessity, it is always based on the program of the next higher echelon.

In preparing either the weekly or master schedules it is essential that certain principles be kept in mind. These are conveniently listed as:

1. *Continuity*—indicating that certain subjects run continuously throughout the training period. Dismounted drill or first aid fall into this category.

2. *Progressive training*—refers to the slow and gradual building up of a unit in a given subject. Training starts with the simple and gradually leads to the complex. For instance, anatomy and physiology would be taught before splints, appliances and bandages.

3. *Variation*—means specifically the alternation of subjects in such a manner that the same general types of subjects do not follow each other too closely on the same day. For example, it would be poor policy to give calisthenics and drill in the early morning, litter drill in the late morning and a practice march on the afternoon of the same day. All of these require physical exertion. It is more desirable to intersperse classroom instruction and thus modify the days work.

A suggested form for preparing a master schedule is shown on Plate 2.

It prescribes the daily current training by subject, day and hour. It is derived originally from the master schedule and is issued by the commanding officer of the unit involved.

[illegible]

Plate 2. Sample Form for the Preparation of the Master Schedule.

Each individual will receive careful training in the assembling, use, and care of his personal equipment and the manner of displaying it for inspection. (See pamphlet included.)

III. Analysis of Instruction.

The early training will be by the group method. Later training by organizations by application and correction of errors.

IV. Objectives:

All individuals to know how to wear, carry, and use the various articles of equipment issued to them, how to adjust the same properly, how to care for and clean them under all probable conditions, and how to correctly display them for inspection.

V. Inspections:

1. Inspector—
 - a. Detachment (company) commander.
2. Methods of inspection—
 - a. By quiz.
 - b. By execution.
 - c. By observation.

Instructors' Guide. An instructors' guide was published by the Medical Field Service School, Carlisle Barracks, Pennsylvania, September 1942, for the Medical Department Mobilization Training Program 8-1 which outlines the procedure of instruction for each instructional period shown in the MTP 8-1. It provides uniform training for the Medical Department during the present emergency.

The Fundamentals of Military Training. Every officer and enlisted man who plans, supervises, or conducts training must constantly bear in mind the following fundamentals of military training (Field Manual 21-5, "Military Training," Mobilization Regulations 3-1, Training Film 7-295, "Military Training"):

That military training is but the application of common sense to military ends. There is little in military training that the average man cannot grasp if it is properly presented to him.

That, as a rule, those under instruction come to the instructor with an open mind, anxious to accept instruction and ready to interest themselves in their new work. The example of keenness and enthusiasm in the instructor will be reflected by those under training. Half-hearted or leisurely methods will carry a heavy penalty later in battle.

That the average man is more quickly and permanently impressed with a fact when it is taught to him as something which has a practical value. It is the instructor's duty to make his pupils understand the practical battle value of the knowledge taught.

That evidence to the student of satisfactory progress stimulates his interest and enthusiasm. Praise must be given where it is due, genuine effort encouraged, mistakes corrected by constructive criticism.

THE CONDUCT OF INSTRUCTION

Introduction. The success in reaching the standards provided by the training program will depend primarily on the care which is taken on the selection and training of instructors. Knowledge of the subject is not alone sufficient. The programs of the special service schools are devised to instruct the students in "how to teach" as well as "what to teach." The instructor must be able to arouse the student's interest in his subject and then, by use of proper methods of instruction transmit the necessary knowledge to the student (paragraph 61, FM 21-5).

Instructor. From time to time, in all phases of training, it is necessary for the unit commander to utilize most of his officers and noncommissioned officers as instructors, in order to complete the training program as planned. Instructing is one of the means by which leadership and initiative are developed. It is essential that the individuals selected as instructors either possess or develop the following personal and professional qualifications: (Section II, TM 1-1000).

Personal.

The instructor must be experienced in handling men.

He must be a model of neatness in dress and cleanliness of person.

He must have a personality that inspires confidence and stimulates interest.

His manner must be pleasant but firm in dealing with students.

He must have a keen interest in his subject.

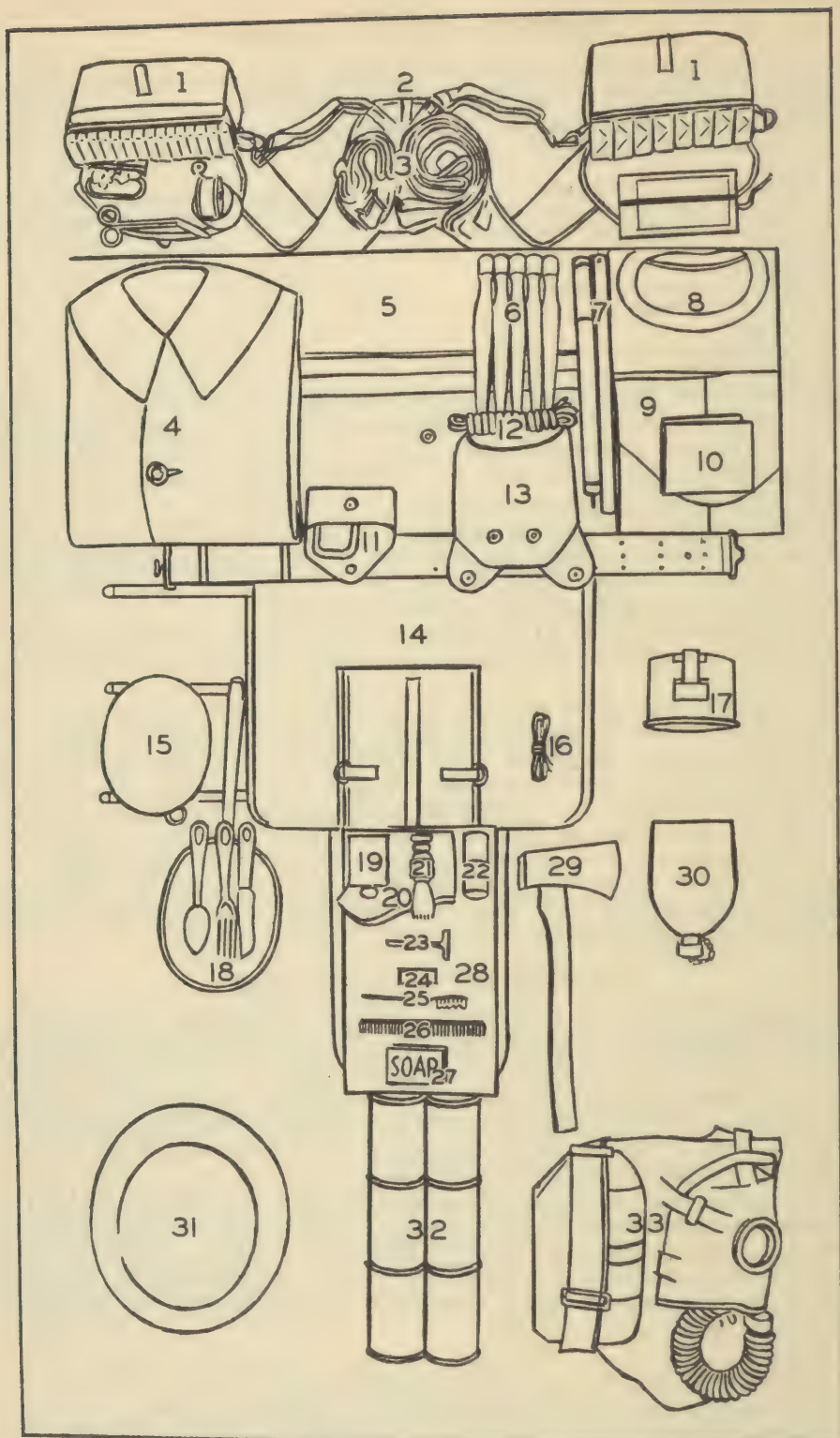


Plate 4. Display of Individual Equipment (new). Dismounted, Medical Department.
(To accompany Training Guide. See legend on opposite page)

He must be sympathetic with the student's problems and must be able to put himself mentally in the position of the student.

His voice and speech should be pleasing, forceful and clear.

He must possess the enthusiasm and cheerfulness of good health.

He must be as courteous to classes as to his superiors.

He must be able to exert self-control and patience in handling his students.

Professional.

He must have a complete knowledge of the subject to be taught, as well as closely related subjects.

He should be able to plan instruction and must be competent to carry the plan into effect. This includes detailed work in securing supplies and equipment.

He must be able to demonstrate successfully the subject which he is to teach.

He must have a knowledge of proper instructional methods, and be able to apply them.

This is meant to include a definite aim, limited to a few fundamental points. It may include preparation of questions in advance in order to simulate the class and direct attention toward the vital facts presented.

The instructor must always bear in mind the education, the age, and the physical condition of the student. The language used must be that which the student understands. Examples, comparisons, and contrasts cited must be within the student's experience.

Training of Instructors. Regardless of the source of instructors, the officer responsible for the attainment of the training objective, for which the instruction is to be given, is charged with the responsibility of preparing the instructors to teach the assigned subjects. Those who are deficient in the technique of their subject are brought up to standard. Coordination and uniformity of instruction must be assured by conferences and troop schools for instructors held prior to the commencement of training. The unit commander must verify the instructor's ability to teach and his knowledge of correct methods, as well his zeal and enthusiasm.

In training instructors, they must be impressed with the importance of planning their work to make full use of the available time. They must assure themselves that all necessary equipment and such aids to instruct as are available are in proper condition before the period begins.

Mechanism of Instruction. The process involved in teaching must be understood and mastered by the instructor. It applies in teaching a single lesson, a specific item of information or procedure, or an entire subject. It consists of: preparation by the instructor, explanation, demonstration, application, examination, and discussion.

Preparation by the Instructor. The instructor must have mastered the subject which he is to teach. He must analyze the subject and the schedule he is to follow, considering the purpose of the subject and the essential facts which must be taught. He must select

1. Instrument case and medical pouches; flaps underneath, tags and pencil pulled up.
2. Medical suspender; no space between suspender and shelterhalf.
3. Two cantele straps and 2 litter carrying straps.
4. Raincoat, 8½" x 10" folded flush to edges of shelterhalf.
5. Shelterhalf and blanket.
6. Tent pins; begin 1" from pole.
7. Tent pole; end with nail toward inspecting officer.
8. Shirt; flush to edges of shelterhalf.
9. Drawers; half over shirt.
10. Handkerchief; to bottom edge and center of drawers.
11. Web pistol belt, first aid pouch.
12. Tent rope.
13. Canteen pouch.
14. Haversack; no space between it and suspender flaps.
15. Meat can cover; 1" from handle.
16. Shoe laces, neatly rolled.
17. Canteen cup; line up with the outer edge of middle buckle and edge of canteen.
18. Meat can, knife, fork, and spoon, "U. S." up, handle 1" from edge of haversack.
19. Toothpowder.
20. Socks, heels to left of inspector, bottom of sock toward him, toes apart.
21. Shaving brush.
22. Shaving stick.
23. Razor.
24. Razor blades.
25. Toothbrush.
26. Comb.
27. Soap.
28. To vel; fold extends to edge of haversack only.
29. Handaxe.
30. Canteen, line up with edge of haversack and edge of meat can.
31. Helmet.
32. Field ration.
33. Gas mask.

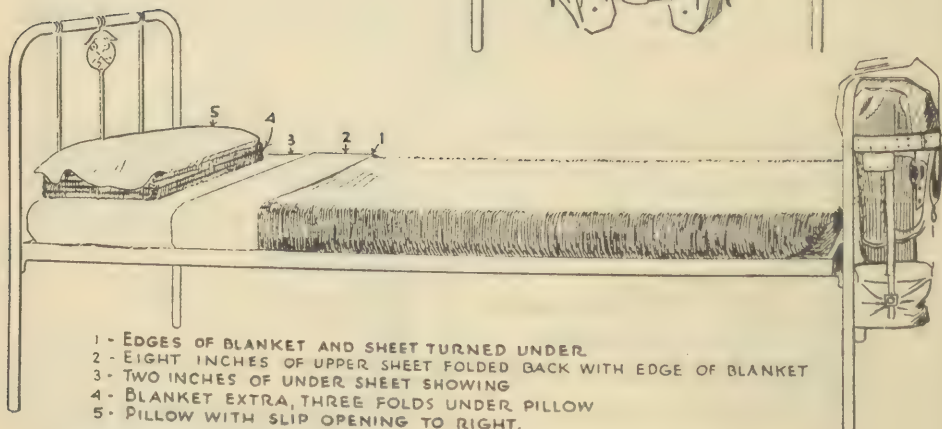
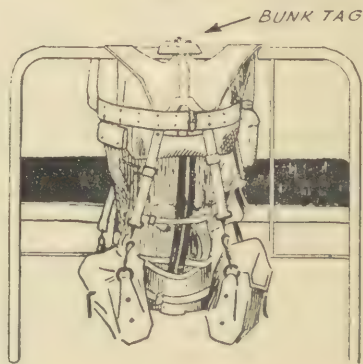
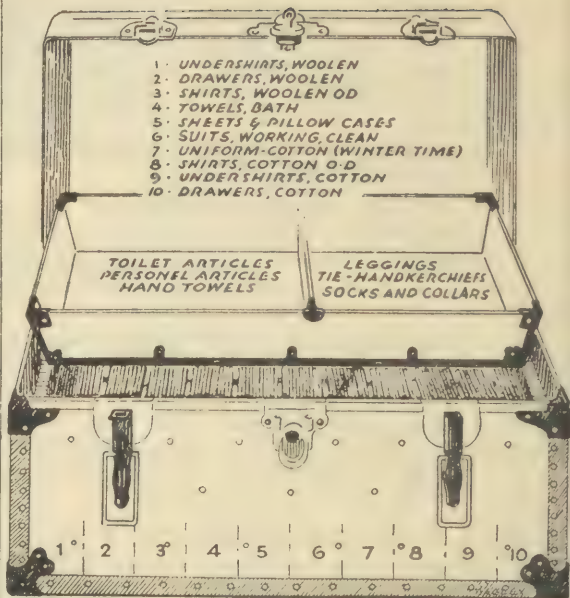
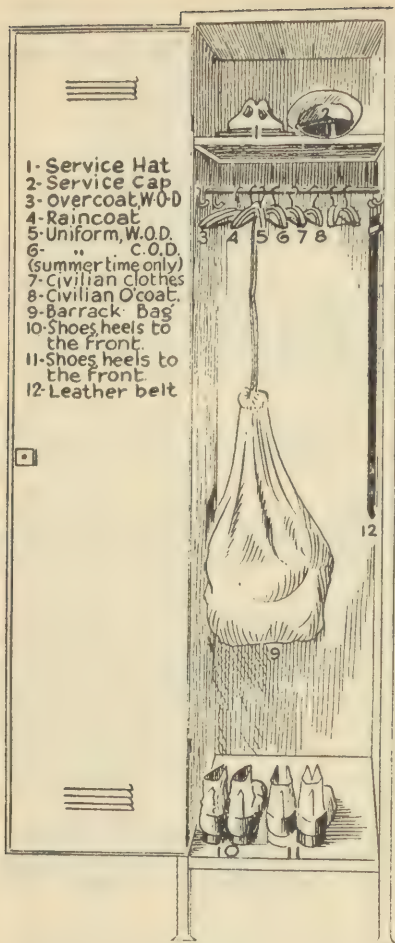


Plate 5. Suggested Arrangement of Individual Equipment and Clothing.

his material, text to be used, equipment and aids to instruction which will be needed. The essential facts are arranged for presentation in a logical and progressive order. He then prepares his specific plan (lesson) for each instructional period. Every period of instruction must be rehearsed repeatedly.

Explanation. The student must understand at the beginning of the instruction just what he is to learn and why he is to learn it. The subject is explained to the student so that his interest is gained and his mind prepared to receive the instruction. Lengthy explanations are avoided and an illustration or experience sought which will accomplish the desired result. Comparison or contrast to those things which the student already knows are preferable to a detailed discussion. Narratives which are brief, to the point, and which excite interest are advantageous in gaining and holding the student's attention. The lecture and conference are the usual explanatory methods.

Demonstration. A demonstration of the subject will generally make a more lasting impression than can be made by other means. Graphic, step-by-step illustrations are helpful in teaching certain subjects. The use of carefully rehearsed demonstrations simplifies instruction and aids the student in remembering the points brought out. Training films provide excellent demonstrations of many subjects. They may be repeated as often as is necessary to make the essential points clear. Vision is a sound basis for imparting knowledge.

Application. By practice of those things in which he has received instruction the student acquires further knowledge through his performance and develops skill by repetition. Application must be supervised by the instructor in order to prevent the forming of bad habits which are difficult to eradicate. Under supervision the students practice correct methods until those methods become fixed habits.

The soldier must be so thoroughly conditioned that he will automatically function in the stress of battle.

Intelligent use of competition between individuals and groups stimulates interest and activity and increases knowledge and skill. The object of such competition is the use of friendly rivalry to establish the proficiency of all in the subject, not to emphasize relative merit between individuals and groups. Systematic and continuous competition tends to develop jealousy and prevent the development of teamwork.

Tests and Examinations. An examination should serve to review the essential subject matter previously presented in instructional periods. The important points must be stressed by the questions asked of the class. Practical performance tests are the most desirable types available. Answering questions on paper is inadequate from the military standpoint, except in the most academic subjects. The great bulk of military subjects are practical in character and should be examined in that light. The training inspection is conducted periodically as a practical check on individual and unit progress and proficiency.

An outstanding feature of the examination, whether oral or written, is the fact that the student is encouraged to present his best efforts. He tries to be outstanding in his work as compared to that of his fellow students. In his effort to excel he will review the subject, attempt to analyze the material and consider its practical applications in the field. The knowledge that the examination will be used to judge him will spur the student on to greater effort. The examination should never be used as a threat.

Examination questions should be confined to the essential facts of the subject. Questions should be framed to suggest practical application of the knowledge acquired, not simply to test the memory. Questions must be clear; there must be no doubt in the student's mind as to the information desired. A question that can be misunderstood will be misunderstood. Questions for written examinations should be discussed with a disinterested person before they are given to the student. They should always require specific answers, questions such as "Tell all you know" or "Discuss briefly" should be avoided. Examinations should be susceptible of uniform grading for fairness in comparison. The "objective" types of examination are best suited for this purpose and lend themselves to rapid grading. The true and false, fill-in and underlining tests are particularly applicable to military testing.

Provision should be made for full discussion of an examination with the students examined to point out errors and clear up all points of misunderstanding.

Examinations which reveal lack of knowledge of the essentials of the subject, or inability to apply the knowledge to particular situations, indicate either faulty instruction or lack of ability or application on the part of the student. Supervision by the commander will generally indicate whether the instructor or the student is at fault. When there is a general failure on the part of a group to absorb instruction, the methods of instruction used should be critically regarded and the instructors surveyed to determine where the fault lies.

Discussion. The purpose of discussion is to sum up and clarify the important points of the subject which have been developed by the previous steps. In the discussion the instructor points out correct and incorrect methods of execution and makes uniform the general understanding of the subject. The discussion may take the form of a conference and, when held at the conclusion of an applicatory tactical exercise, is generally called a critique.

Methods of Instruction. The only means by which human beings can impart ideas to one another are through the physical senses—seeing, hearing, smelling, tasting, and feeling. Teachers impart ideas to students by one or more of these physical senses. Teaching methods have been developed from this fundamental fact. The teaching methods most commonly used for military instruction are: lectures, conferences, demonstrations, group performance, coach-and-pupil method and cadence drill.

Lectures. A lecture is an oral discourse. It may be given with or without aids to instruction. Without such aids a lecture involves the use of but one physical sense by the audience, hearing. Lectures which are illustrated by training films, film strips, charts or diagrams are more valuable than lectures in which no aid is used. The lecture method is one of the poorest methods of imparting knowledge because the teacher has no way of knowing whether or not his lecture is making the proper impression, if any, on the mind of the student. Considerable experience is required before the instructor becomes an effective lecturer. He must rehearse constantly and must be thoroughly prepared. An enthusiastic individual makes the best type of lecturer.

The success of this method of instruction depends upon the subject, the character of the audience, the phraseology and form of presentation of the subject, and the use made of aids to instruction. The instructional value of a lecture is dependent not only on the personality, method of delivery, and experience of the instructor, but also on the mental level of his audience and its experience in acquiring knowledge from lectures. Lectures are frequently employed in the training of officers, occasionally in the training of noncommissioned officers, but have limited value in the instruction of organizations in mass.

The lecture method may be used when it is necessary for one instructor to present certain subjects to a large group of students, or to introduce courses of instruction. The development of the training film permits an excellent presentation of certain difficult subjects, requiring considerable explanation.

Lectures should be brief and confined to the subject. No lecture should exceed fifty minutes in length; in recruit training, periods of fifteen minutes are preferable. Demonstrations accompanying lectures increase the teaching value. Many instructional aids such as illustrations by training films or strips, lantern slides, charts, diagrams, and blackboard drawings may be employed to increase the efficacy of the lecture method of instruction. Every effort shall be made to visualize the subject matter.

Conferences. The conference method of instruction is a directed discussion of a subject. A conference may be used for a detailed discussion either of text material which has been studied by the class or of a subject presented to the class by the instructor. Conferences are most often concerned with the application of a doctrine or procedure to specific situations. This method presents or explains ideas by use of the sense of hearing as does the lecture method. It has the distinct advantage over the lecture method in that it enables the instructor to determine readily whether his ideas are making the correct impression and allows the student to clear up, by questions, those points which he does not understand.

Although a conference does not require a long discourse, as does a lecture, it requires more preparation, skill, and alertness on the part of the instructor. In preparation he must anticipate pertinent questions and be able to give sound reasons for the correctness and incorrectness of all points at issue. He must be skilled in leading the discussion in such a way that the minds of the students will be kept on the subject under discussion. He must be alert to guard against loss of control of the discussion. Questions of general interest are encouraged to expose and clear up obscure and difficult points. Irrelevant and inconsequential questions, which lead away from the subject or waste time in discussion of trivial points, must be skillfully avoided.

There are two general types of conferences, the informational type and the developmental type. In the informational type the instructor states facts which he wishes the students to learn and answers questions, asked by the students, to clear up points which are not understood. This type transmits facts from the mind of the instructor to that of the student. It is used when the instructor is sure that the ideas transmitted will be accepted as true by the students.

The developmental type of conference requires the student himself to develop the ideas which the instructor wishes to teach. Leading questions are put by the instructor and are answered by the student who uses his own reasoning and judgment. This method requires the student to have sufficient basic knowledge of the subject to work out a reasonable answer to a question which the instructor may ask. This method enables the instructor to impress the essentials of the subject on the student's mind and develops confidence on the part of the student in his ability to think his way through problems on the subject under discussion. When the conference method of instruction fails to evoke response and interest it may be assumed that another method of presenting the subject should be employed.

The conference method offers an advantage over the lecture in that the class participates with the instructor in the selection and dissemination of ideas. The tendency for the class to be alert is increased in proportion as the students participate in the discussion. With class participation comes also a variation in approach to subject matter through the medium of the various members of the class.

Demonstrations. A demonstration is an accurate portrayal of a subject or procedure to be taught. A well-planned and carefully presented demonstration is one of the most effective methods of instruction in basic, technical, and tactical and logistical subjects. The demonstration is based on the fact that seeing an object or procedure generally makes a more rapid and lasting impression on the mind than that obtained by the other senses. A demonstration is always preceded by a thorough explanation of the work to be demonstrated and therefore is not a distinct and separate method of instruction. Demonstrations used in conjunction with other methods of instruction add to the instructional value of the other methods.

A demonstration demands considerable preparation on the part of those concerned with its execution. Preparation includes a careful study of the subject, complete plans based on the result of such study, and, finally, repeated rehearsals by all personnel involved in the demonstration. The demonstration should convey to the student not only a clear and accurate picture of the subject or procedure but also a standard of excellence which he or his group is to attain. It should arouse admiration and stimulate a desire to emulate it.

The many time-consuming factors in demonstrations such as preparation, rehearsal of the necessary troops, time required to set up facilities and equipment, time lost in taking the group to and from observation points, are all eliminated by the use of training films. In planning instruction FM 21-6 should be consulted and full use made of the available training films for demonstration purposes.

In preparing for a demonstration the subject must be studied from all aspects, and the entire demonstration must be worked out in detail before rehearsals are attempted. Decisions must be made as to exactly what is to be demonstrated; what phases are to be emphasized; what facilities are at hand and what additional facilities must be procured; the personnel and equipment necessary; and the exact time and place of not only the finished demonstration but also of the rehearsals.

The above decisions having been made, the entire plan for the demonstration should be drawn up in the form of a scenario, setting forth clearly and in detail the following information:

The purpose of the demonstration.

Text references applicable to the subject being demonstrated.

Preparation needed for the demonstration.

Troops or other personnel required.

Uniforms and equipment for troops.

Demonstration equipment.

Instructor's equipment.

Place where demonstration is to be held.

Maps, if any are required.

Arrangements for rehearsals.

Procedure to be followed. This should be shown in detail, step by step, and in correct sequence.

In demonstrating to personnel unaccustomed to this form of instruction, the demonstration should not be too involved or executed too rapidly lest the various phases shown become simply a confusion of movement to the students. On the contrary the demonstration should be simple and executed slowly in order that all may obtain an exact and correct idea of the subject or procedure.

In basic military training it will be found that demonstrations can be used to advantage in teaching such subjects as:

The soldier dismounted.

The squad.

Individual equipment.

Individual cooking.

Motor driver training.

First aid and bandaging.

The shelter tent.

Interior guard duty.

Military courtesy.

Heavy tent pitching.

In technical training the method of instruction by demonstration is highly important and if properly used will save much time in training individuals and small groups in their technical studies.

In tactical training, demonstrations usually show the movement and functioning of groups of individuals or units in combat. Since most tactical exercises are intricate and complex, demonstrations for the instruction of enlisted men should be limited to those by the company and smaller units. Demonstrations of tactical exercises by units larger than the company generally have their application in the instruction of officers.

Of particular value at large installations is the dramatic skit or playlet which illustrates a special point or series of points. Suggested outlines of several such demonstrations appear in the Instructors' Guide for Med. Dept. Everyone is interested in play-acting, and such demonstrations will attract considerable attention. It must be kept in mind that full use of the sense of vision should be attempted at all times. Every lecture lends itself to some small demonstration of technique or procedure.

Group Performance. The group performance method of instruction may be used in the training of any group, regardless of size or organization. It provides careful, simultaneous learning under the direct supervision of an instructor, and centralizes control within the group for the purpose of teaching the mechanics of any subject. It is particularly valuable when there is a lack of well-trained instructors. Its disadvantage lies in the fact that personnel under instruction are frequently removed from the control of their normal commanders. It is an excellent method for use following introductory training and is especially well adapted to instruction in basic subjects. It consists of four distinct steps, as follows:

Explanation of the subject or action by the instructor.

Demonstration of the subject or action by the instructor or his assistant.

Imitation (application) by all undergoing instruction.

Correction of errors by the instructor and his assistants.

The group performance method is excellent for instruction in various technical operations by the slow-motion or step-by-step procedure. After explaining and demonstrating the action the instructor performs each step slowly, accompanying the action with a detailed explanation. The student imitates every movement made by the instructor. Assistant instructors verify the correctness of the students' movements. When

a large group is being instructed in this manner several assistant instructors all go through the slow-motion action simultaneously.

The inherent value of this method of teaching lies in that the student hears, sees and executes the procedure himself, and is corrected on the spot.

Coach-and-Pupil Method. The coach-and-pupil method logically follows the group performance method or other explanatory system and should never be used as an introductory method of training. Its greatest usefulness will be found in instructing large groups of individuals who have passed through other methods of instruction and have mastered many of the subjects of basic military training. In this system individuals are paired off, and, acting alternately as coach and pupil, teach each other the procedure previously explained and demonstrated by the instructor. Properly applied and supervised, this teaches the individual to think as well as to do, stimulates his powers of observation, increases his alertness, teaches him to give commands, and adds to his individual value by giving him a detailed knowledge of training matters.

The procedure is as follows:

The entire class is divided into as many groups as there are instructors available.

Groups are divided into pairs with an initial assignment of one of each pair as coach and the other as the pupil.

The instructor first describes the subject or its first phase and then demonstrates it slowly and with precision.

Next he gives the group an opportunity to clear up any uncertainties regarding the subject by asking if there are any questions. After assuring himself that all understand the work, he directs the coaches to proceed with the instruction.

Thereupon, each coach explains and demonstrates the work to his pupil.

Coaches then have their pupils execute the work or movement and attempt to detect and correct all errors.

The instructor regulates the progress of the instruction and corrects errors made by the coaches. Whenever he notices faults in the coaching he stops the instruction and by explanation and demonstration corrects the errors he has detected.

After a short period of instruction the relation is reversed; the pupils become the coaches, and the former coaches the new pupils.

After proficiency has been attained by both members of all pairs in the first phase of a subject, or the entire subject, the instructor explains and demonstrates the next phase or the succeeding subject and the process of tutoring by pairs is continued as before.

The relationship of coach and pupil must be properly maintained; pupils should not criticize the work of the coaches. When the situation is reversed, the former pupil, then acting as a coach, can call attention to the errors in the instruction just given him.

Only one subject, or part of a long subject, should be taken up at a time. The presentation of too much will only result in confusion and failure to accomplish satisfactory results.

The coach-and-pupil method is applicable to instruction in many subjects of basic and technical training.

Cadence Drill. To facilitate instruction and to insure exactness in the execution of close order drill and exercises for physical development, there has been developed a method of training called the "*cadence drill*" or "*command exercises*," which causes the men in ranks or groups to give aloud and in unison the necessary commands and counts for the various movements. Its field of usefulness is limited to instruction in close order drill and exercises for physical development, where, if properly used, it constitutes a valuable aid. It emphasizes the essential parts of the movement by breaking it up into steps, insures exactness of execution, makes the men feel that the whole operation is essentially theirs, serves to increase their sense of responsibility, and stimulates their interest and enthusiasm. It affords every man an opportunity to develop confidence and ability, the former through hearing his own voice, the latter through learning how to enunciate and time his commands properly.

The mechanics of the cadence method as applied to instruction in drill are as follows:

The unit being in line, it is desired to have it execute a "Right Face". The instructor announces: "Face the platoon to the right", or "The platoon will execute Right Face", and then "COMMAND". At the word "Command" each soldier will call out "1. *Right*, 2. *FACE*, ONE, TWO" and execute the movement. This method may be applied to many movements of drill. When the cadence method is used to count cadence during physical exercises or while marching at drill the command "1. Cadence, 2. COUNT" is used. Each soldier counts aloud and sharply "1, 2, 3, 4, 1, 2, 3, 4," beginning with the left foot as it strikes the ground after the command "COUNT." The odd numbers are repeated as the left foot strikes the ground, the even as the right foot strikes the ground. Only two sets of four are counted after the command of execution.

Aids to Instruction. Devices and means which assist in focusing the student's attention on the subject or impart knowledge by use of more than one physical sense are great aids to instruction. Some of the more generally used aids are discussed below. Thought and ingenuity on the part of the instructor will find many more.

Training films and film strips. Training films and film strips are among the most valuable and most modern aids to instruction. Their use should be a *planned* part of the instruction in all subjects for which they are available. They are not to be considered an emergency or substitute form of instruction. They are not designed to be the sole means of instruction in a subject but are to be used as instructional aids.

Training films are motion pictures sound or silent, produced specifically for use as visual aids in expediting and standardizing instruction in all demonstration, or illustration of subjects. They make use of the national habit of acquiring information from motion pictures and hence are a highly valuable aid to military instruction.

Training films are classified as:

Basic. To present factual knowledge of basic subjects of general instruction such as "Personal Hygiene," "Military Courtesy," etc.

Mechanical. To explain the mechanical functioning or operating characteristics of weapons, material and equipment; to illustrate the organization of equipment of units; and to explain physical or chemical phenomena of military value.

Technical films. To illustrate the use of weapons and equipment and the actions of an individual or of a group in performing an operation or series of operations.

Tactical. To illustrate the application of the basic doctrine of combat tactics of the different arms and services.

Training films are aids to all methods of instruction in a great variety of subjects. In the conference method they may be used to present and explain the subject or to demonstrate correct procedure which should be followed.

Their use permits the instructor to demonstrate the application of a doctrine or technique which would otherwise be impossible due to limitations of terrain, personnel, facilities, time, or funds. Demonstrations by moving pictures focus the students' attention on the essential points and eliminate objects and action which are diverting.

Training films save time and clarify the first three steps in the group performance method of instruction and aid the instructor using the coach-and-pupil method in description, demonstration, and correction or errors.

A film strip is a strip of standard motion picture film, the individual frames of which contain still photographs, diagrams, charts, detailed drawings, or similar representations which are projected on a screen or wall. Film strips are important aids to all methods of instruction, both in the presentation of new material and for review and refresher purposes.

Film strips usually are made from data contained in a field or technical manual and therefore are not accompanied by lecture notes or outlines. If various sources were used in making the strip, notes or an outline may accompany it. The instructor should study the film strip in conjunction with the manual and make such notes as may be necessary for his explanation of the subject. He should know the strip so well that he will not have to study the screen while speaking. Since it is necessary to darken the room when using film strips, it is desirable to break the instruction into periods so that the lights are turned on and the instructor regains contact with his audience.

There is a tendency in a darkened room to drowse and it is necessary for the instructor to speak a little more loudly than usual and to be particularly alert to keep the interest up to the highest pitch.

It is not sufficient to show film strips without explanation. Unless the instructor precedes the showing of the strip with an introduction of the subject, and unless he continues explanation while the film strip is being shown the entire purpose of the strip will be defeated.

Where charts or facilities for making charts, are not available the blackboard may be used to "build" charts. This system offers the advantages of being cheaper, subject to rapid changes and showing the class one item at a time.

Film strips simplify and save considerable time in the preparation of charts. The requisite strip is projected on paper at the desired size, and the enlarged view is traced in the proper colors. Many charts may be made in this manner for outdoor instruction, where the film strips themselves could not be used.

Training films and film strips, which have been released, are listed in FM 21-6.

Blackboard. A blackboard will be found useful both indoors and outdoors for certain kinds of illustrations. Maps or sketches, drawn or developed on the blackboard, aid in presenting a clear picture to the class. Bold, heavy lines are used, and the sketch or figures must be large enough to be clearly seen by all students. The instructor should draw rapidly, keep to the right of the work, and point with his right hand. If it is necessary to turn the head away from the audience the instructor should raise his voice or, if necessary stop speaking. When not using material on the board he should step away from it, and, as soon as it is no longer required, it should be covered or erased. Figures and illustrations which are not being used tend to divert attention.

Charts. Drawings made to represent a fact, a group of facts, or an idea, aid in all methods of instruction to focus the attention of the audience. Most charts consist of line drawings accompanied by explanatory words or figures. The drawing should express the thought so clearly that few words or figures are required. Many charts on technical subjects, particularly in the care and operation of weapons, material, and equipment, have been prepared by the procuring services or are available in the technical manuals.

Charts must be sufficiently large and clear to be distinct to all members of the class. They may be prepared by the use of film strips and lantern slides.

The instructor should stand to one side of a chart when discussing the material on it. He should not look at it except when pointing to a specific word or phrase on it. Charts should be withdrawn or covered after use unless there is definite reason for leaving them displayed to the class. Where sliding boards are not available, charts may be hung on an easel and folded over the top after use, or they may be built up and then uncovered successively.

Maps. Maps on which operations are indicated should be of large enough scale so that the symbols on them can be seen with ease by students in the back of the room. Terrain features, cities, and other items to which reference may be made, should be emphasized by special lines or lettering. A map scale of three inches to a mile is large enough for use in a room that will hold an audience of 100. A map scale of six inches to a mile covers too little ground to be used in presenting large operations, but more detail can be given on it in the operations of small units. Symbols and other indications to represent the opposing forces should be made with a broad-pointed pen and colored inks.

When successive operations are to be shown on the same terrain on maps, this may be done either by the use of movable symbols, or by a series of map cutouts on which each phase of the operation is drawn and which are placed on the map with thumb tacks, one over the other, and stripped off as the changes take place. In using movable symbols it is desirable for the instructor to have an assistant to move the symbols as the instructor proceeds with his lecture.

Lantern slides. Lantern slides are valuable visual aids. The audience should be prepared, by explanation, for the picture or slide to be shown. The same procedure should be followed in the use of slides as in the use of film strips. Lantern slides are suitable

for illustrative pictures, for display of outline maps showing the progress of operations, or to emphasize, by display of the printed word, certain important points.

In preparing slides for historical illustrations of military operations it is advisable to prepare a basic map, containing only the detail that will be essential, for the series of slides prepared for the same ground. On this basic map the positions of the opposing forces can be drawn in for each phase and any additional place names needed may be added. The symbols indicating the opposing forces, and arrows indicating the direction of operations, should be drawn in outline, and when the print has been transferred to the glass slide the outlines can be colored for the opposing forces. Too much detail on a slide is confusing and should be avoided. It is rarely desirable to use photographs of maps such as are found in books of military history since the audience cannot make a close examination of detail, as can the reader of a book. When it is desirable to show terrain features in connection with operations it is better to prepare a separate slide showing only the terrain.

Classroom. The effectiveness of instruction in a classroom is increased greatly by provision of suitable facilities. The room should be well lighted and well ventilated. Blackboards should be provided. If students are expected to take notes or to use maps, sufficient tables or lapboards of suitable size should be provided. Wall boards are required for the display of maps, and charts. A projector and a screen should be installed if lantern slides, film strips, and training films are to be shown. A stand with a manuscript light is a great aid to the instructor. The instructor must assure himself in advance that his voice will be audible and all visual aids clearly seen by the students in the back and at the sides of the room.

Outdoor Instruction. The same care should be exercised in choice of ground for outside instruction as in choice and arrangement of classrooms. A small ravine or cup-shaped area makes a good amphitheater for giving a lecture. If no such ground is available, sloping ground may be used, the students being placed on ground above the instructor. By having rows of students sit, kneel, and stand, assurance may be had that all are able to see illustrations or demonstrations which are used. The voice must be raised to be sure that all hear the instructor's remarks. In the instruction of large groups it is well to have one or more assistants with the students farthest removed from the instructor to warn the instructor if his voice is not heard, and to aid in directing the students' attention to the instruction. Portable loud speakers, if available, are a great aid in outdoor instruction, particularly in demonstrations and in instructing large groups.

The class must be located outdoors in such a manner that it will not be facing the sun. If shaded areas are not available, it is preferable to have the instructor face the sun, thus keeping the class comfortable during the conduct of training. Should the wind be blowing, it is necessary that the class be arranged so that the wind blows from the instructor toward the class, thus carrying his words toward the class. It is futile to speak against the wind and doing so will undermine the discipline of the class.

Classes should be placed in positions to avoid their seeing moving objects before them while instruction is being conducted. Trucks and other moving vehicles will detract from instruction by attracting the eyes of the class.

Training Expedients. Every effort should be made, in both indoor and outdoor exercises, to promote realism and increase interest by the employment of training expedients. These have a wide application to training in technical and tactical subjects.

Training expedients (instructional aids) are of two general types. There are those items issued by the government specifically for rationing purposes. Among these are gas identification sets (sniff bottles), gas detonation sets, training films, film strips and the anatomical charts. The latter are listed by number in the Medical Supply Catalog and are among the most excellent instructional aids available. The bulk of the instructional aids however, are home-made. These vary in type according to the individual ingenuity of the officer preparing them. Their field is limited only by the resourcefulness of the instructor. Instructional aids have been produced from waste materials such as old lumber, photographs and scrap materials.

An extremely valuable series of instructional aids may be produced to simulate the

various types of battle wounds. These may be made of paper mache, cardboard or tin cans and painted to represent particular type wounds. The realism lent to the medical soldiers training by such aids will prove of infinite value on the field of combat.

Effort should be made to accustom troops to the noise and confusion of battle. Detonation of TNT blocks and firecrackers, the sound of klaxons, sirens and other noise-producing devices, the use of tear gas and smoke candles, all are of value in preparing troops for battle conditions. Sound track and phonograph records of battle imitation sounds, may be amplified through a portable public address system to give an excellent imitation of battle sounds. One airplane equipped with a sound track and amplifying device can imitate the sound of a large number of planes in air attack. Ingenuity, used with care to prevent accidents, should be exercised by all commanders in the effort to simulate battle conditions in training.

Lesson Planning. The efficient use of available time requires a careful analysis of each lesson. Without careful lesson planning the value of the instruction received will never be commensurate with the time used.

Basis for lesson. An instructor requires the following information before he may effectively complete his lesson plan:

The subject, and the scope of the instruction to be given.

The training schedule or program of which the lesson is a part.

The duration of the period of instruction.

The number of students to whom the lesson is to be given.

The previous knowledge and experience of the class.

The place in which the instruction is to be conducted.

Lesson analysis. With the above information determined the instructor must make a general analysis of the lesson. This analysis includes consideration of each of the following:

What is the scope of the subject matter to be covered in the instructional period? What must be done in the period and what must the instructor know in order to do it?

How should the student be prepared for the lesson? Is a previously prepared text assignment desirable? Will a brief explanation or illustration be satisfactory? What will tie this lesson to those previously taught?

What method of instruction will be most effective in teaching the subject?

Does the subject matter lend itself to any particular means of arousing and maintaining the students' interest? What historical examples, illustrative stories, etc., are applicable?

What methods or means may be employed to require the student to apply the ideas and knowledge taught him or to gain skill in procedure?

What type of examination is most suitable for determining the effectiveness of the instruction and impressing the subject on the student? Should it be an oral or written examination or a performance test?

What points are to be summarized in the discussion at the end of the period?

How shall the total time of the lesson period be proportioned to the various phases of instruction to accomplish the best results? This time allotment must be borne in mind during the whole analysis and a final time schedule should be made at the completion of the plan. If time estimates are too short it will generally be for one or all of the following reasons:

Over-enthusiasm on the part of the instructor, causing him to extend his remarks, illustrations, or questions beyond the allotted time.

Lack of the necessary background on the part of the student or a failure on the part of the instructor to appreciate the difficulty of the lesson, which prevents the presenting of new ideas as rapidly as planned.

Failure of the instructor to adhere closely to the subject, usually the result of questions which digress from the particular lesson.

Lesson plan. Having made the analysis the instructor should write out his lesson plan. This is essentially an outline of the lesson in the order and manner in which it is to be presented.

Lesson outlines may be in the form of key statements or in the form of an actual formal outline with headings and sub-headings. In any case the important points to be emphasized are included in the outline in proper order, as are also the points where charts or other instructional aids are to be used.

Rehearsal. When the lesson plan is completed the instructor should set up the necessary equipment, illustrations, and other aids to instruction and conduct a practice run on the presentation of the lesson. Such a rehearsal furnishes a check on the time allotment and assures the delivery of a smooth, natural presentation.

Practice in lesson planning will develop facility and insure the attainment of training objectives in the allotted time. Failure to plan lessons will result in incomplete or sketchy instruction, loss of interest, and the waste of valuable time.

The value derived from the lesson is in direct proportion to the care and thought put into its preparation and to the enthusiasm with which it is conducted.

Common errors in instruction. When a group under instruction fails to reach the desired standard in the allotted time, the reason must be found without delay. Some of the more common causes of failure are:

Incorrect interpretation of the training program by those conducting the instruction. Conferences, attended by all instructors, held prior to the commencement of the program as well as during the course of the program, will assure a complete understanding of the full intent of the training. The teaching mission must be clearly understood by all instructors.

Insufficient time allotted to the program. The preparation of a good program of instruction requires practical experience in time and training values, and a thorough study of local conditions, qualifications of available instructors, facilities for carrying out the program, and the personnel to be trained.

Lack of knowledge or of preparation. There is no substitute for full knowledge of the subject to be taught. Preparation is the first requirement of an instructor. Lack of preparation is generally inexcusable. It may be prevented by supervision, and, when discovered appropriate action must be taken to prevent a recurrence. All instructors must be made to realize the importance of their responsibility in being prepared.

The use of wrong methods of instruction should be discovered by supervision and inspections, and correct methods must be adopted at once. Such methods will vary with the instructor, the type of class and subject at hand.

Poor personality of the instructor. When it is found that the personality of the instructor is objectionable, it is best to relieve him and detail another instructor.

Insufficient and ineffective supervision and inspections. Neglect of responsibility may be due to inexperience or indifference. Only by constant supervision and inspection can incorrect methods be discovered and full compliance with the training program assured. Administrative details and other duties not directly concerned with training must not be allowed to interfere with training supervision.

Advice to Instructors. Never bluff to cover lack of knowledge. While the instructor is expected to know his subject thoroughly, questions may arise which bring up unconsidered aspects of the subject. If the answer is not known, admit it, determine the correct answer, and give it to the class as soon as practicable.

Avoid the use of profanity or obscenity. Frequent use of profanity and any use of obscenity result in a loss of dignity and of the respect of the class that cannot be regained.

Never use sarcasm or ridicule. Since the students cannot retort, their resentment is aroused. When an individual is resentful his mind is closed to the acceptance of instruction.

Never talk down to a class. The instructor and the class must feel, not that the instructor is of higher intelligence, but that he has been fortunate in acquiring experience and knowledge which he wishes to share with fellow members of his profession.

Never decide that the student is stupid. The instructor's task is to teach the student, using the means suitable for transmitting the information. If the student doesn't learn the instructor has failed.

Always speak to the class within the range of its own knowledge and experience. Use words and expressions commonly understood by most persons.

Remember that the instruction is given to assure success in battle. Use every opportunity to *impress the student with the battle importance* of what he is learning.

Applicatory Tactical Exercises. The foregoing methods of instruction apply with special reference to basic and technical training. To a limited extent they apply to tactical training, but, when progress has developed beyond the training of individuals and small units, applicatory tactical exercises are utilized. The applicatory method of training to develop tactical proficiency consists of instruction in tactical doctrine, followed by its application under assumed, outlined, or represented situations which simulate, as closely as possible, conditions of actual war. The value derived from this training will vary directly with the realism with which battle conditions are simulated. The various applicatory tactical exercises are defined as follows: Where the term "map" is used below it should be understood to include all forms of map substitutes.) (Section VIII, FM 21-5).

Map exercises are exercises in which a series of military situations are stated and solved on the map. All students solve the requirements individually, after which the solutions are discussed in a general conference.

Map problems are exercises in which a military situation is stated and solved in writing with the map as the only guide to the terrain. The solution is graded.

Map maneuvers are exercises in which military operations with opposing sides are conducted on a map, the troops and military establishments being represented by markers, or crayon symbols, which are moved to represent the maneuvering of the troops on the ground. Map maneuvers may be either one-sided or two-sided. In the former case, the players are assigned to one side only and the enemy movements are controlled by the director. In minor tactics, sand tables or miniature ranges, in which the terrain is represented to scale, may be substituted for the map.

Tactical rides or walks are exercises in which a series of military operations are stated and solved on the ground, the troops being imaginary. Solutions are generally oral, but may be written, and are discussed in a general conference on the terrain.

Terrain exercises are exercises in which a military situation is stated and solved on the ground, the troops being imaginary and the solution being in writing. Usually, the solution is graded.

Staff rides or walks are exercises in which practical staff operations in definite strategic, tactical, or logistical military operations are stated and solved on the ground. The troops are imaginary and the solutions generally are expressed in the form required under actual conditions of war.

Historical rides are exercises in which past military operations such as a battle or a campaign, are studied on the ground on which the operations took place.

Field exercises are exercises conducted in the field under simulated war conditions in which troops and armament of one side are actually present in whole or in part, while those of the other side are imaginary or outlined. They are of general application in the training of all troops. When the troops present consist only of command, staff, and communications personnel, they are termed *command post exercises*. *Command post exercises* may be one or two-sided exercises.

Field maneuvers are exercises in which a military operation is conducted on the ground, the troops and armament of both sides being actually present, either wholly or in part, and all the conditions of actual war being simulated.

Joint Army and Navy exercises are field maneuvers in which both Army and Navy forces take part. They are either:

- (1) Grand joint exercises in which the United States fleet as a whole, or one or more of its major subdivisions, takes part.
- (2) Minor joint exercises which include all joint exercises other than grand joint exercises.

The Preparation of Tactical Exercises for Small Units. The officer who is confronted with the task of preparing realistic, instructive, and interesting tactical problems for small

units may save time and increase the effectiveness of his mental product by proceeding along a well-charted course in their preparation. It is not easy to prepare good tactical problems for small units.

Start with a clear decision as to the medical mission to be accomplished. It must be based on the tactical mission. For instruction in the tactical employment of medical equipment for example, it may be the selection of station sites, occupation of these sites and the scheme of evacuation. Medical missions should involve action to be taken in the case of attack, defense, operations by day and night, and under adverse conditions. The purpose of the exercise must be decided upon before preparation can be undertaken. Let your requirements be specific and logical. Make certain that all members of the unit engage in the exercise by including tasks which are appropriate to their assignments. There is nothing more boring to the individual than to go out on a tactical problem and wait for interminable hours for something to happen. In preparing the problem the officer should start with the final situation which is to be presented in the exercise and then work back to the beginning by logical steps, each leading into the one to follow.

TRAINING OF THE MEDICAL UNITS FOR FIELD OPERATIONS

In addition to the training peculiar to the Medical Department, the medical unit participates in practice marches, maneuvers, and like training as conducted by the armed services to which it is attached or of which it is an integral part.

Basic Military Training. All enlisted personnel of a medical unit are required to be proficient in the basic military subjects as prescribed in War Department orders.

In general, basic subjects are those studied in common by all troops, regardless of arm or service. They include all individual defense and protection as well as dismounted drill and military courtesy. For basic subject and text references see the thirteen-week detailed mobilization training program included later in this chapter.

Technical Training. The technical training of the medical unit includes all of the special training and instruction required for its administration and to enable it to perform the technical services for which it is responsible. For technical training subjects of divisional medical units and attached medical personnel see the thirteen week mobilization training program included later in this chapter.

Tactical Training. The tactical training includes logistical movements of the medical unit and the operation and function of the various medical installations operated by the unit in the field, in combined field exercises and under combat conditions with the associated arms.

Training of Medical Department Officers for Field Duty. Medical Department officers are trained in administration, methods of training, field hygiene and sanitation, supply, military law, combat principles of arms to which their unit is assigned or attached, field orders, standing operating procedures, map reading and sketching to include the interpretation of aerial photographs, and field fortifications.

The Medical Department Mobilization Training Program. On February 18, 1942, a new Medical Department Mobilization Training Program 8-1 for Medical Department units at Unit Training Centers was published by the War Department.* An extract copy of this program follows:

* A separate program, MTP 8-5, for 11 weeks has been used, as a substitute, at Medical Replacement Training Centers. This program is similar in most respects to that of MTP 8-1. All enlisted men are required to have two weeks of basic training before they are assigned to specialist schools. MTP 8-10 will be issued shortly for the training of specialists of the medical department. Chapter 2 of the *Instructors' Guide* gives the detailed programs for the training of specialists.

SECTION I. GENERAL

1. **AUTHORIZATION.** This Mobilization Training Program is issued in compliance with MR 3-1.

2. **PURPOSE.** The purpose of this program is to furnish a general guide for the balanced training of Medical Department units so that they may be prepared to take the field on short notice.

3. **APPLICATION.** *a.* The training programs apply to all types of medical units and installations. Based upon these programs training schedules will be prepared by the responsible unit commanders.

b. The instruction day is 8 hours with 4 hours on Saturday. More time per day may be utilized when desirable, especially in connection with marches, field exercises, and the like. The open time will be used to compensate for interruptions; to bring individuals or units up to standard; to provide refresher training; or for purposes of mass athletics, competitive games, and morale building in general.

c. In order to obtain the latest references it is essential to consult the most recent edition of FM 21-6, which contains a list of training publications, training films (sound and silent), and film strips. This manual is frequently revised. Ordinarily, field and technical manuals, training films and film strips will contain sufficient instructional matter for training purposes. Army Regulations should also be used.

4. **MODIFICATIONS.** The programs may require modification to adapt them to training for the type of medical unit in which the individuals are being trained; to shorten or lengthen the time of training in order to conform to the time available; to make the best use of existing facilities and of training expedients; and to conform to the climatic or other conditions affecting the training situation. Progressive and balanced training in subjects essential to accomplish the training mission must, however, be observed at all times.

5. **SCOPE OF INSTRUCTION.** *a.* General training will be conducted in accordance with the doctrine prescribed in FM 21-5, TF 7-295, and TM 1-1000.

b. *First or basic period (1st and 2d weeks for all men).* The preliminary training of the individual enlisted man will be stressed. At the end of this period he should be able to wear properly, display, and care for his uniform and equipment; understand and correctly practice indoor and outdoor military courtesy; and have an applicatory knowledge of the essentials of all basic subjects prescribed in this program.

c. *Technical period (3d-10th weeks, inclusive).* Training of the individual enlisted man continues, but emphasis is placed upon fundamental technical subjects which will fit him for actual practice or further training in a medical unit or installation. In addition to the technical subjects, specialist (common or administrative specialties) training, tactical and logistical training is begun.

d. *Tactical period (11th-13th weeks, inclusive).* This period should be devoted largely to field and applicatory exercises. At the end of this period personnel intended for tactical medical units should be able to march and execute tactical movements with facility, establish and operate stations, collect and treat casualties in the field during day or night, operate battalion or regimental aid stations, and participate with the associated arms both in field exercises and under combat conditions. Generally, personnel intended for professional units or installations should be able to qualify as ward attendants, either medical or surgical, and have sufficient technical knowledge to act as basic technicians in Medical Department specialties. It is not contemplated that training under these programs will qualify either medical or surgical technicians for the higher ratings in the Medical Department. For individuals qualified to receive further training in Medical Department specialties, such as dental, laboratory, pharmacy, veterinary, x-ray, medical, and surgical technicians, application may be made to The Surgeon General for attendance at the Medical Department enlisted technicians' school for enlisted specialists courses. Men so qualified may be selected by the end of the 8th to 10th week of training.

e. *Subjects.* (1) *Basic period.* The essential minimum of military training consists of the following instruction, the foundation of which must be completed within the first two (2) weeks:

(a) Military courtesy and discipline. An understanding of the necessity for discipline, the punitive Articles of War, the penalties for violation, and the methods of administering military justice. Instruction in the essentials of correct military conduct should be supplemented by continuous attention to its application during all subsequent training.

(b) Personal hygiene, sanitation and first aid. An understanding of the importance of personal hygiene (including sex hygiene), the prevention of venereal disease; group sanitation and the rules for maintaining sanitary conditions, particularly in the field; an understanding of the proper rendering of first aid to the wounded and gassed, and practice in the use of the first aid packet, splints and tourniquets.

(c) Equipment, clothing, and tent pitching. Practical knowledge of the correct manner of displaying clothing and equipment; the care and preservation of arms, equipment and clothing; the assembling and adjusting of the pack, and care of individual equipment; the pitching and striking of shelter tents; and inspection of formations.

(d) Physical training. Participation in group calisthenics for improving the physical condition of the individual.

(e) Interior guard and drill for foot troops. Ability to execute individual movements and those of close and extended order formations, with reasonable precision; to have a practical knowledge of the duties of a sentry on interior guard duty.

(f) Nomenclature and care of organizational equipment. This time is to be utilized in familiarizing individuals with equipment and supplies peculiar to the Medical Department and with the proper care of equipment.

(g) Marches and bivouacs. An understanding of march discipline and technique; ability to march with a unit carrying full field equipment, and to occupy and break bivouac. During this training opportunities should be created for supplementing and practicing the instruction contained in (b), (c), (e), and (h).

(h) Individual defense measures. Practice in the use and wearing of the gas mask. Identification and means of defense against hostile chemical agents; elementary knowledge of how and when the enemy may use such agents. Knowledge of the essentials of scouting and patrolling, and the use of cover and concealment. An understanding of the location and construction of individual shelter and the use of camouflage. A knowledge of the markings identifying friendly and hostile aircraft and armored troops, and measures for antiparachute, antiaircraft, and antimechanized defense.

(2) *Technical, tactical, and logistical.* Technical and tactical employment of a medical field unit including establishment and operation of stations; collection and treatment of casualties in the field; the operation of regimental and battalion dispensaries; and the preparation for participation with the associated arms in field exercises and under combat conditions. See Section II for subjects, hours, and text references.

(3) *Specialists.* In so far as is practicable, administrative (common) specialists will receive instruction concurrently with the instruction of the training unit as a whole, and proportionately with the rates of occurrence of such specialists, as determined and published from time to time by the War Department. At the discretion of the commanders of units, administrative specialists will be excused from instruction in subjects not particularly allied to their intended or contemplated specialty, provided they have been thoroughly qualified in the basic subjects. For detailed programs, common or administrative specialists, see Section III.

SECTION II. TRAINING PROGRAM

6. MASTER PROGRAM

Subject	Hours allotted to each subject										
	Nonspecialist (521)	Basic Medical or Surgical Technician (521)	Basic Dental Technician (Chair Assistant) (521)	Basic Veterinary Technician (521)	Junior Sanitary Technician (196)	Bandman (021)	Clerk (052) and (055)	Supply Sergeant and Receiving and Shipping Clerk (186)	Mess Sergeant (124) and Cook (060)	Truckmaster (068) Foreman Mechanic (066), and automobile mechanic (014)	Truckdriver (068) (245) (345) Motorecyclist (678)
Military courtesy and discipline -----	6	6	0	6	0	0	0	0	0	0	0
Personal hygiene, sanitation and first aid -----	5	5	5	5	5	5	5	5	5	5	5
Equipment, clothing, and tent pitching -----	9	9	9	9	9	9	9	9	9	9	9
Individual defense against chemical attack -----	6	0	0	0	0	0	0	0	0	0	0
Individual defense against air, parachute, and mechanized attack -----	5	5	5	4	4	2	2	2	2	2	2
Interior guard -----	8	8	8	8	8	2	2	2	2	2	2
Dismounted drill -----	29	29	23	19	21	15	15	12	12	12	21
Marches and bivouacs -----	45	45	29	21	29	15	15	12	12	12	31
Physical training -----	39	39	27	21	27	15	15	6	6	0	27
Hasty entrenchments and shelter (camouflage) -----	12	12	4	4	2	4	4				12
Elementary anatomy and physiology -----	21	21	18	0	0						8
Nomenclature and care of organization equipment -----	6	6	0	4	4	2	2	2	2	2	2
Field medical records -----	5	5	5	3	3	3	3	3	3	3	3
Treatment of gas casualties -----	5	8	4	4	4						4
Litter drill, including ambulance loading and unloading, and passage of obstacles -----	10	10	10	8	8	4	4	4	4	4	4
Field sanitation and sanitary appliances -----	20	20	12	6	6	1	1	1	1	1	9
Material medica and pharmacy -----	12	12	10	7	7						2
Medical and surgical nursing -----	16	16	12	8	8	2	2	2	2	2	6
Heavy tent pitching -----	6	6	6	4	4	2	2	2	2	2	2
Organization and function of the arms -----	9	9	7	4	4	1	1	1	1	1	3
Organization and function of the medical unit -----	9	9	9	4	4	1	1	1	1	1	1
Medical aid (splints and splinting; bandages and dressings) -----	60	60	33	20	31	8	8	2	2	2	35
Movement by motor -----	4	4	2		2						2
Movement by rail -----	4	4	2	2	4	2	2				4
Scouting and patrolling, use of cover and concealment -----	6	6	6	6	6	3	3	3	3	3	3

Subject	Hours allotted to each subject										
	Nonspecialist (521)	Basic Medical or Surgical Technician (521)	Basic Dental Technician (Chair Assistant) (521)	Basic Veterinary Technician (521)	Junior Sanitary Technician (196)	Bandman (521)	Clerk (062) and (065)	Supply Sergeant and Receiving and Shipping Clerk (186)	Mess Sergeant (124) and Cook (000)	Truckmaster (068) Foreman Mechanic (086), and automobile mechanic (014)	Truckdriver (068) (245) (345) Motorecyclist (678)
Map and aerial photograph reading†	15				13						15
Orientation in night combat	14	6	8	4	8	4	4				10
Communications in combat	10	5	5	5	10	5	5				10
Technical and tactical employment of medical field units	95		68	65	85	65	65				92
Troop movements by motors	16		16	16	16	16	16				16
Inspections	17	17	11	8	11	5	5	2	2	2	11
Open time	50	50	34	26	34	18	18	6	6	6	34
Total hours (General, basic, technical, tactical, and logistical training)	572	433	306	308	396	220	220	88	88	88	306
Training in Specialty (see detailed program; pars. 8-17 inclusive)											
Basic			16	24	16	28	28	34	44	44	16
Technical		139	144	216	144	202	202	406	396	396	144
Open time			16	24	16	32	32	44	44	44	16
Total	572	572	572	572	572	572	572	572	572	572	572

† This instruction applies especially to chauffeurs, motorecyclists, messengers, liaison agents, and any other individuals of Medical Battalions or Regiments, as determined by the Commanding Officer. For other individuals, this time may be utilized for additional instruction in any subjects.

7. DETAILED PROGRAMS

[illegible]

Subject	References	Total hrs.	Hours per week												
			Basic training	Technical, tactical, and logistical training											
				1	2	3	4	5	6	7	8	9	10	11	12	13
B. TECHNICAL															
(10) Hasty entrenchments and shelter (camouflage)	Secs. I, VIII, and IX FM 8-15; Secs. 1-4, FM 8-20; TF 7-35 (30 min); FS 8-3	12								4		4		4	
(11) Elementary anatomy and physiology	Ch. 2, TM 8-220	21			3	3	3	4	4	4					
(12) Nomenclature and care of organization equipment	App MD Sup Cat; T/BA 8, App 1, 11, and 111; FM 8-10; TM 8-220	6	2			2	2								
(13) Field medical records	FM 8-45; Ch. 6, TM 8-220; AR 40-1025	5	1	2			2								
(14) Treatment of gas casualties	Ch. 7, TM 8-220; TM 3-205, TM 8-285; FM 21-40; TC No. 3 and 4, WD, 1942; FS 3-1; TF 8-304.	8				4			2	2					
(15) Litter drill including ambulance loading and unloading; and passage of obstacles	Chs. 3 and 4, FM 8-35; FS 8-10; TF 8-33	10	2	2	2	2		2							
(16) Field sanitation and sanitary appliances	FM 8-40; FM 21-10; Ch. 5, TM 8-220; FS 8-1 to 8-5; FS 8-9 to 8-12, incl.	20		1	3	2	2	4	4	4					
(17) Materia Medica and Pharmacy	TM 8-233; 8-220	12			4	3	3		2						
(18) Medical and surgical nursing	Ch. 4, TM 8-220; 8-200; 8-500; FM 8-45; AR 40-1005; 40-1025, 40-500	16	1	1	2	4	2	2	2	2					
(19) Heavy tent pitching.	App 1, FM 8-5; Sec. VI, FM 21-15; FS 8-39	6	2			2		2							
(20) Organization and function of the arms.	Ch. 2, FM 4-5; Secs. I, IV FM 5-5; Secs. I and II, FM 6-5; App II, FM 7-5; appropriate T/O's; FM 8-10 100-5; 101-5; 101-10; TF 7-236	9	1		3		3		2						
(21) Organization and function of the medical unit.	FM 8-5, FM 8-10, T/O 8-series	9		1	1	2	3	2							
(22) Medical aid (splints and splinting; bandages and dressings).	FM 8-50; Ch. 10, FM 21-10; Ch. 3, TM 8-220; FS 8-7; 8-15; 8-25 to 8-31 incl; 8-35 to 8-37 incl; TF 8-33; 8-150	60		2	7	5	6	7	8	8	5	6	4	2	

Subject	References	Total hrs.	Hours per week												
			Basic training		Technical, tactical, and logistical training										
			1	2	3	4	5	6	7	8	9	10	11	12	13
C. TACTICAL AND LOGISTICAL															
(23) Movement by motor (practice in entrucking and detrucking, only 2 hrs. daylight, 2 hrs. dark)	Par. 190, FM 22-5; Sec. V, FM 25-10; Ch. 9, FM 100-5	4						2			2				
(24) Movement by rail, entraining and detraining	Sec. I, Ch. 6, TM 5-400; 25-10; Sec. I, Ch. 3, FM 100-10; AR 30-910, 30-920, 30-945, WD Cir. No. 56, 1940	4										2			2
(25) Scouting and patrolling, use of cover and concealment	Pars. 201, 206, 215, 231-233, and 236, FM 7-5; pars. 222, 224, 231 and 232, FM 21-100; FM 30-30; FS 5-3; 5-10, TF 7-2-4; FM 21-45	6	3		3										
(26) Map and aerial photograph reading*	FM 21-25, 21-30; FM 21-10; 5-1, 5-2, 5-3, 5-4, 5-5, 5-6, 5-7, 5-8, 5-9, 5-10, 5-11, 5-12, 7-233	15 (15)*								2	6	7			
(27) Orientation in night combat*	Par. 212, FM 7-5; pars 587-601, FM 100-5	14 (8)*					2	2	2		4*		4*		2*
(28) Communications in combat*	Ch. 8, FM 11-5; Chs. 2, 3, 5 and 6, FM 24-5; FS 11-1; TF 7-13	10 (5)*													
(29) Technical and tactical employment of medical field units (Battalion and regimental medical detachments, medical battalions and regiments and/or similar regiments)†	FM 5-20; 7-5; 8-5; 8-10, 8-50, 8-55, 21-10, 21-100, 22-5, 25-10, 100-5, 100-10; TM 5-400, 8-220, 8-260, 8-285, 8-500, 12-250; FS 8-1, 8-3, 8-7, 8-9, 8-17 to 8-22, incl., and 8-25 to 8-31 incl.	95† (95)*				1	2	3	4	10	10	21	21	23	
(30) Troop movements by motors*	Ch. 3, FM 25-10; Ch. 9, FM 100-5	16 (16)*												8	8
(31) Inspections	Sec. IV, FM 21-15; FM 7-5, 21-5; pars. 239-242, FM 22-5; TM 10-545; AR 40-205; AMB No. 23, 3rd Edition	17	1	1	1	2	1	2	2	1	2	1	1	1	1
Open time (see par. 3b)		50	2	4	4	4	4	4	4	4	4	4	4	4	4
Total		572	44	44	44	44	44	44	44	44	44	44	44	44	44

NOTES

*The time marked with parentheses (), in the detailed programs, is available for training basic medical and surgical technicians in professional subjects. See paragraph 8 for the scope of this 136 hours of instruction.

†Technical and tactical employment of field units.
The distribution of the 95 hours marked (†) in the Detailed Program is shown in the following table.

Six of the training subjects in the table below are marked with an asterisk. The instruction in subjects so marked will be conducted concurrently by the various elements of the unit in which such subjects are common.

Training Subject	Elements and Hours					
	Attached Medical	Head-quarters and Service	Collecting	Clearing	Ambulance	Professional
29(a) Functions and combat dispositions of sections of headquarters and service, collecting, ambulance, or clearing elements		15	15	15	15	
29(b) Reconnaissance, use of cover and concealment	10	10	10	10	10	
29(c) *Collection and evacuation of casualties from the field (day and night)	30		30			
29(d) *Ambulance driving shuttle (day and night)					15	
29(e) *Ambulance driving convoy (day and night)					15	
29(f) *Nursing and ward management (see scope of instruction for junior medical and surgical technicians) (95 hours)				30		95
29(g) *Transportation and supply requirements		15				
29(h) *Procurement and issue of supplies		15				
29(i) Selection and occupation of various station sites, and the functioning of integral parts of station	15	15	15	15	15	
29(j) Forward displacements and withdrawals during action	5	5	5	5	5	
29(k) Operation of regimental and battalion dispensaries	15					
29(l) Battalion or regimental training (field exercises)	20	20	20	20	20	
Total	95	95	95	95	95	95

8. TECHNICIANS, BASIC (medical or surgical)

Hours, scope of instruction, and text references. See paragraph 7c. subjects (26) to (30) incl. for hours allotted.

Subject	Number of Hours	Scope of Instruction	References
General	13	Responsibility for public property; Medical department property lists, issue, exchange and credit; patient's property and effects; personal effects in case of death; care of linen (soiled and clean); special linen.	Sec. III, Ch. 6, TM 8-220
Ward Management	65	Duties of ward masters; duties of ward attendants; ward discipline; prison wards; care of ward supplies, medicines, narcotics, whiskey and poison; isolation in care of communicable diseases; care of, and reports in connection with, seriously ill and insane; care of mail and telegrams. Structure and mechanism of sterilizers. Preparation of linens and instruments (for sterilizers) and their sterilization. Antisepsis and asepsis as applied in preparation of patients, surgeon and assistants.	Ch. 4, TM 8-220
Care and treatment of patients	39	Admission and bathing of patients. Taking and recording pulse, temperature, and respiration; change in appearance of patients; bed making and changing of linens; use of urinals and bed pans; alcohol rubs; care of hair, mouth, and nails of patients; administration of medicines, routine and special; lee bags, hot water bags, uses and cautions in placing them; enemas, all types, their composition, preparation, use and methods of administration.	Ch. 4, TM 8-220
Diets	10	Care of dishes, set-up of trays, size of servings; diets, light, soft, liquid, regular, and special.	Sec. IV, Ch. 6, TM 8-500
Ward records	12	Admission cards, and Medical Department 55-series forms. Inter-ward transfer cards, diet lists, ward morning report, laundry lists; disposition roster, seriously ill roster; patients' pass list; notice of death. Duty cases. Filing of all records.	Sec. I, Ch. 6, TM 8-220 FM 8-45
Total	139		

9. DENTAL TECHNICIANS, BASIC (Chair Assistant)

(For the periods, the 1st-6th and 11th-13th weeks, inclusive see par. 7, Detailed Programs. Section II.)

Subject	References	Total Hours	Hours per Week			
			7	8	9	10
BASIC						
Dismounted drill	Pars. 114-158, FM 22-5	4	1	1	1	1
Physical training	FM 21-20; AR 605-110	4	1	1	1	1
Inspections	Pars. 239-242, FM 22-5	8	2	2	2	2
Total Basic		16	4	4	4	4
TECHNICAL						
Orientation of men in general duties		2	2			
Anatomy and phys- iology	Ch. 2, Sec. II, TM 8-220 Any standard text. TM 8-225.	12	6	6		
General care of a dental clinic	Ch. 5, TM 8-225	10	6	4		
Medical and dental supplies and equip- ment	Ch. 6, TM 8-220; Chs. IV, VII, TM 8-405	10	5	5		
Care of equipment and supplies	Ch. 5, TM 8-220	10	6	4		
Duties at the chair	Ch. 5, TM 8-220	10		4	6	
Clerical duties	Ch. 6, TM 8-220; Chs. VI, X, TM 8-405	10		8	7	
Diagnosis, dental first aid, materia medica, and therapeutics	Ch. 3, Sec. II and Ch. 4, Sec. V, TM 8-220; FM 8-35	8	6	2		
Oral hygiene	Ch. 5, Sec. VIII, Ch. 4, Sec. II, Par. 205, Sec. V, TM 8-220, Ch. 5, TM 8-405	6	4	2		
Transporting, setting up and packing dental field equip- ment, MD Chest No. 60, and kits	Ch. 5 and 6, TM 8-220; Ch. VIII, TM 8-405	10		4	6	
Sterilization, dressings and bandages	Ch. 6, Sec. III, TM 8-225	6			3	3
Personal hygiene of dental personnel	Ch. 6, Sec. I, TM 8-225	6		1	3	2
Practical test		40			10	30
Inspections and examin- ations		4	1	1	1	1
Total Technical		144	36	36	36	36
Open Time		16	4	4	4	4
Grand Total		176	44	44	44	44

10. VETERINARY TECHNICIANS, BASIC

(For the Periods the 1st-4th and 11th-13th weeks inclusive, see Par. 7, Detailed Programs Section II.)

Subject	References	Total Hours	Hours per Week					
			5	6	7	8	9	10
BASIC								
Dismounted drill	Pars. 114-158, FM 22-5	6	1	1	1	1	1	1
Physical training	Chs. 1-3, FM 21-20, AR 605-110	6	1	1	1	1	1	1
Inspections	Pars. 239-242, FM 22-5	12	2	2	2	2	2	2
Total Basic		24	4	4	4	4	4	4
TECHNICAL								
Elementary Anatomy and Physiology	Ch. 3, FM 25-5; Par. 4, AR 40-2250; appropriate text book	21	9	9	3			
Field Veterinary Records	Sec. III, AR 40-2245; FM 8-5; AR 40-2000 series	5					2	3
Embulance (animal) Loading and Unloading	None	10	1	1	1	7		
Medical and Surgical Nursing (animals)	FM 25-5; AR 40-2080; AR 40-2085; AR 40-2086; AR 40-2085; AR 40-2125; AR 40-2135	16	8	8				
Medical Aid (Splints and Splinting; Bandages and Dressings)	Par. 137, FM 25-5	67	18	18	18	13		
Technical and Tactical Training (Veterinary Elements)	FM 8-5; FM 8-10; T/O 2-11; T/O 6-11; T/O 8-89; FM 8-15; T/O 9-99	97			14	16	34	33
Total Technical		216	36	36	36	36	36	36
Open Time		24	4	4	4	4	4	4
Grand Total		264	44	44	44	44	44	44

(See Sec. IV, Chap. 3 for the instructors guide to this training.)

II. SANITARY TECHNICIANS, BASIC (Junior)

(For the periods 1st through 4th, and 9th through 13th weeks, inclusive, see detailed program, Section II.)

Subject	Text References	Total Hours	Hours per Week			
			5	6	7	8
BASIC						
Dismounted drill	Pars. 114-158, FM 22-5	4	1	1	1	1
Physical training	Chs. 1-3, FM 21-20; AR 605-110	4	1	1	1	1
Inspections	Pars. 239-242, FM 22-5	8	2	2	2	2
Total Basic		16	4	4	4	4
TECHNICAL						
Basic principles of military sanitation	Chs. 1-2, AMB 23; Ch. 1 and Sec. 1, Ch. 2, FM 8-40; Chs. 1-2, FM 21-10	7	7			
Control of Respiratory diseases, and hous- ing	Chs. 3-4, AMB 23, Sec. II, Ch. 2, FM 8-40; Ch. 3, FM 21-10	9	9			
Food-borne disease of the intestinal tract and mess sanitation	Chs. 5, 8, 9, 10, 12, 13, AMB 23; Sec. III, Chs. 2, 5, 6, 7, FM 8-40; Secs. I, II, V, VI, Ch. 4, FM 21-10	14	14			
Water treatment and purification	Chs. 6-7, AMB 23, Ch. 3, FM 8-40; Sec. III, Ch. 4, FM 21-10	24	6	18		
Disposal of wastes	Chs. 13, 14, 15, 16, 17, AMB 23; Ch. 4, FM 8-40; Sec. IV, Ch. 4, FM 21-10	34		18	16	
Insect-borne diseases and control of insects	Chs. 19, 20, 21, 22, 23, AMB 23; Chs. 8, 9, 10, FM 8-40; Ch. 5, FM 21-10	28			20	8
Control of venereal diseases	Ch. 24, AMB 23; Sec. V, Ch. 2, FM 8-40; Ch. 6, FM 21-10	3				3
Mass physical examina- tions and mass im- munization	Ch. 27, AMB 23; Ch. 13, FM 8-40	4				4
Sanitary surveys, re- ports and orders	Ch. 26, AMB 23; Ch. 11, FM 8-40; Sec. II, Ch. 8, FM 21-10	11				11
Vital statistics	Ch. 28, AMB 23; Ch. 15, FM 8-40	10				10
Total Technical		144	36	36	36	36
Open Time		16	4	4	4	4
Grand Total		176	44	44	44	44

12. BANDSMAN (021).

(For the periods 1st and 2d, and 11th-13th weeks inclusive, see par. 7 Detailed Programs Section II.)

[illegible]

13. CLERK (052) and (055)

(For the periods 1st, 2d and 11th, 12th, and 13th weeks. See par. 7 Detailed Programs, Section II.)

Subject	References	Total Hours	Hours per Week							
			3	4	5	6	7	8	9	10
BASIO										
Dismounted drill	FM 22-5	8	1	1	1	1	1	1	1	1
Physical training	FM 21-20; AR 605-110	8	1	1	1	1	1	1	1	1
Inspections	FM 21-15, 22-5	12	1	2	1	2	2	1	2	1
Total basic		28	3	4	3	4	4	3	4	3
TECHNICAL										
Military correspondence, au- thorized abbreviations, filing	AR 340-5; Ch. 20, TM 12-250; AR 850-150; Ch. 16, TM 12-250; pp. 7-23; W.D. correspondence file	14	4	5	5					
Morning report	AR 345-400; Ch. 5, TM 12-250	22	3	5	4	5	4	1		
Service record	AR 345-125; Ch. 4, TM 12-250	12	4	5	3					
Payrolls, final statement, allotments	AR 35-5-20; AR 345-155; AP 245 476; Ch. 12 and 13, TM 12-250	22	4	5	3	5	5			
Personnel records (discharges certificates, desertion, trans- fer, appointment and re- duction of N.C.O., rating and disrating of special- ists) and rosters (troop and duty)	AR 345- and 615-series; TM 12- 250 Letter WD AGO 320 2 (10- 30-40), Subject "Reorganization of Army Personnel System"	22				5	2	5	3	7
Property record and com- pany supply	AR 35-6520 to 35-6700; AR 40-1705	8						4	2	2
Charge sheets	P. 233, App. 3, MCM	6				5	1			
War Department publications and Army Regulations	AR 1-10, 1-15; AR 310-50; TM 12-250	10						5	2	3
Medical Department reports (sick and wounded, statisti- cal, daily sick report, death report)	AR 40-1025; 40-1080; AR 345-415; AR 600-650	18					3	5	5	5
Company funds and collec- tion sheet	AR 210-50; TM 12-250	6							3	3
Typing (applicatory)	Standard text	152	22	16	22	16	21	17	21	17
Total technical		292	37	36	37	36	36	37	36	37
Open time		32	4	4	4	4	4	4	4	4
Grand total		352	44	44	44	44	44	44	44	44

14. SUPPLY SERGEANT, RECEIVING AND SHIPPING CLERK (186).

All the individuals will for the first 2 weeks receive the same basic instructions. See Detailed Programs, par. 1, Section II. Training for the 11th-13th weeks is to be in addition to, and after completion of, course of instruction (3d through 10th weeks, inclusive) of clerk (055). See detailed program for clerk (055) and (052).

Subject	References	Total Hours	Hours per Week		
			11	12	13
BASIC					
Dismounted drill	Pars. 114-158, FM 22-5	1		1	
Physical training	Chs. 1-3, FM 21-20; AR 605-110	3	1	1	1
Inspections	Sec. 14, FM 21-20, DAIR 200-422, FM 22-5	2	1	1	
Total basic		6	2	3	1
TECHNICAL					
Supply and equipment records, requisitions and transfer	Ch. 11, TM 12-250	22	22		
Care, handling and storage of property	Secs. III, IV, and V, TM 10-250	10		10	
Organizational property	T/BA 8	8	8		
Med. Dept. instruments and equipment	MD Sup. Cat.; T/BA 8	35			35
Preparation of Med. Dept. requisitions	MD Sup. Cat.; T/BA 8	16		16	
Vehicles	T/BA 8	7		7	
Unserviceable property	Ch. 11, TM 12-250	8		4	4
Property records	Ch. 11, TM 12-250	8	8		
Total technical		114	38	37	39
Open time		12	4	4	4
Grand total		132	44	44	44

15. MESS SERGEANT (124) AND COOK (060)

(All individuals for the first 2 weeks will receive the same basic instruction. See par. 7, Detailed Programs, Section II. Practical cooking (7th to 13th weeks) and preliminary instruction (3d to 6th weeks) are mutually interchangeable at times.)

[illegible]

899

(All individuals for the first 2 weeks will receive the same basic instruction). (See par. 7, Detailed programs, Section II).

[illegible]

MILITARY MEDICAL MANUAL

17. TRUCKDRIVER (245) AND MOTORCYCLIST (678).

(For the periods the 1st, 2d, and 7th-13th weeks inclusive, see par. 7, Detailed programs, Section II.)

Subject	References	Total Hours	Hours per Week			
			3	4	5	6
BASIC						
Dismounted drill	Pars. 114-158, FM 22-5	4	1	1	1	1
Physical training	FM 21-26, AR 605-110	4	1	1	1	1
Inspections	Pars. 239-242, FM 22-5	8	2	2	2	2
Total Basic		16	4	4	4	4
TECHNICAL						
Starting engines	FM 25-10; TM 10-510, 10-550	2	2			
Shifting gears	FM 25-10; TM 10-510, 10-585	2	2			
Driving	Ch. 2, FM 25-10	40	8	8	8	16
Brakes and braking	FM 25-10; TM 10-510; 10-565; AR 850-15	4	4			
Traffic rules	Ch. 2, FM 25-10	8	2	2	2	2
Special instruction, safe driving	AR 850-15; Ch. 3, FM 25-10; FS 10-43	4		2	2	
Lubrication	TM 10-540	4				4
Convoy operations	Ch. 3, FM 25-10	40	10	16	14	
Care of vehicles	TM 10-510, 10-515; FM 25-10; FS 10-38	32	8	8	8	8
Trouble shooting	TM 10-550, 10-580	8			2	6
Total Technical		144	36	36	36	36
Open Time		16	4	4	4	4
Grand Total		176	44	44	44	44

CHAPTER VII

PLANS AND ORDERS (THE SOLUTION OF THE MEDICAL PROBLEM)

Introduction. Control of a military unit by its commander is exercised by means of orders. Capacity to announce sound tactical decisions and plans in the form of orders is an essential element in the art of troop leading. (See Chapter VII, "Leadership," Part I.) The commander must depend upon subordinates for the execution of his orders. Hence, the subordinates must be informed of their tasks and missions in such clear and unmistakable terms that misunderstanding is eliminated. A Chinese proverb has it that "an order which can be misunderstood will be misunderstood." Battles have been lost by faulty orders just as they have been lost by faulty decisions. The officer who succeeds in command of troops in battle or campaign must acquire adeptness in this art. This chapter deals with the processes by which the medical officer may reach sound and logical decisions as to the accomplishment of his missions, and how he may translate his decision and plans into orders to carry them into execution.

The medical officer faces problems of decision and of planning in the same degree and for the same reasons as his brother of the arms. If his assignment places him within the infantry or cavalry division he will exercise command of medical troops who will be organized into detachments attached to the subordinate units of the division, or he will be with the medical battalion, or squadron as the case may be. Whatever his assignment he must seek and obtain information about the proposed operation of the troops for which he is to provide medical support, he must estimate and analyze the situation which confronts him; he must arrive at a decision and make a plan for its execution; finally, he must transmit his decision and plan to the subordinates who are to execute it or assist him in its execution. It is a difficult task. Mistakes or omissions cannot always be quickly corrected or adjusted. Within the Army time-proven procedures have been developed as a *guide* in acquiring this necessary ability. But they must serve only as a guide because each situation in battle will present its own special requirements which may vary widely from preconceived notions. Medical officers must learn these essential troop-leading procedures in order that they may carry out their humanitarian missions with the smooth and certain execution which efficiency dictates.

The Medical Mission. The specific mission for medical troops is rarely included in the commander's orders incident to the conduct of battle or other military operations. In general, the mission of the Medical Department is to provide continuous medical service for the troops supported under all situations. The mission of the combat troops influences the general type of the medical operation. For this reason, the medical mission is stated specifically in conformity with the operations in which the troops supported are engaged, *e.g.* "To provide medical support for the division (regiment) in an enveloping attack." In making plans or recommendations, the specific medical mission must always be paramount.

The Surgeon's Recommendation, or Medical Plan. An important function of all staff officers is the preparation of plans for proposed operations. These plans elaborate the commander's directive and supply the major details necessary to carry out the operation. Planning of transportation, supply, and evacuation is initiated at a G-4 conference at which the commander's directive is announced. Time may be allowed for the staff officers to make reconnaissances and secure any other information necessary to formulate their recommendations. These recommendations are submitted at the final G-4 conference, where each staff officer submits a plan for the employment of his particular unit. When the plans are coordinated and any conflicts such as locations, traffic circulation, and methods of employment are adjusted, G-4 approves the recommendations. Pertinent extracts of the approved plans are published in the administrative order or annex and distributed to all units concerned.

The division surgeon is a member of the division special staff. He is responsible for submitting the medical plan at the G-4 conference. Many of the details for the medical

plan may be supplied by the medical battalion commander or he may actually prepare the plan. In either case the policies of the division surgeon will greatly influence the tactical employment and disposition of the medical battalion. Division S.O.P. will often establish the onus of responsibility between the division surgeon and the commanding officer of the medical battalion for the actual labor of preparation of the detailed medical plan.

The battalion surgeon is likewise a member of the infantry battalion staff, and as a staff officer is responsible for submitting recommendations for the employment of the medical section of the infantry battalion. In this instance the medical plan is brief and simple and may contain only the recommendation for the location of the battalion aid station. This recommendation is submitted to the infantry battalion commander or the executive officer for approval.

THE ESTIMATE OF THE SITUATION

The mechanics of making an estimate of the situation involves no more than the adoption of a logical process of thought. It is the negation of "snap" judgment. It is an attempt to insure consideration of all the factors. While it may not, in fact, produce in all cases the "best" solution, it should provide a "workable" solution, at the least, provided always that the officer making the estimate has the requisite training and exercises sound judgment. In its application it may be oral or written, brief or lengthy, completed in a brief period or require considerable time for its completion. War plans for the defense of the nation against potential threats to our peace and safety, for example, are developed continuously and perhaps may never be said to be completed. It requires the ultimate degree of painstaking, time-consuming care. On the other hand, a commander in battle "lives" with the situation and attempts to foresee all of the hostile capabilities, and in the exercise of this foresight he devises tentative plans to meet them. Under these conditions a commander may announce his decision and plans with only momentary delay after the occurrence of an event which requires a decision. The time consumed to make the estimate may be said to "float" between these wide limits, but the commander of troops in battle will rarely have more than a bare minimum of time for this exclusive purpose. He must use foresight to gain the required time. Since *Time* is dominant in war the commander is faced continually with the two ever-conflicting requirements: *First*, a succession of sound decisions is necessary for success; *second*, the substance of his decisions and plans must reach the subordinate commanders in the form of orders in time to be applied.

There is no open road to the development of logical processes of thought. Educators have striven with the problem for centuries with results which they would not claim to be entirely adequate to the need. It is not a simple problem. The ability to reason, analyze, and decide must be present, or all mechanical aids will fail, however adequate or useful they may be in other hands. The form reproduced below for the use of medical officers in the solution of their own tactical problems is a guide, an aid, and experience indicates that it is a useful one. Its use in training to develop proficiency should serve to fix in the mind of the student a sequence of reasoning which may be followed with confidence to arrive at a decision involving the use of medical means. It serves only to stress the important factors. It can be followed in any given situation only in so far as it is practicable.

FORM FOR A MEDICAL ESTIMATE OF THE SITUATION

1. MISSION.—State the mission assigned by higher authority or deduced from instructions from that source.

Note: The mission is the governing element in every plan. It must never be disregarded. While it is true that a medical mission invariably includes the provision of some phase, or phases of medical service, the adaptation of the medical service to tactical requirements is definitely a part of the medical mission. For example, a mission "to provide medical support for the division in a night withdrawal" imposes quite different limitations upon a plan than a mission "to provide medical support for the division in defense of a position."

2. SITUATION.

a. Elements of the situation.

(1) *Enemy capabilities.* List the capabilities of the enemy for influencing the medical problem through:

- (a) Strength.
- (b) Position.
- (c) Weapons.
- (d) Casualty producing agents.
- (e) Air action.
- (f) Training.
- (g) Other means.

(2) *Own situation.*

(a) Plan of Commander. State so much of the tactical plan of your commander as may influence the medical problem.

(b) Strength. An index of the number of casualties to be expected.

(c) Position. The position of our troops from the point of view of providing shelter, cover, etc.

(d) Movement. The probable extent, direction and rate of movement of the whole force or any major component thereof.

(e) Any other elements in own situation that may affect the medical service.

Note: Tables of Organization give the authorized strength of units. In map problems, unless it is stated otherwise, or there are factors present which specifically require special computation of strength, it can be assumed that all units are at war strength.

(3) *Physical factors.*

(a) *Terrain.* List the terrain features that may influence the medical service either in the number of casualties or in their collection and evacuation, e.g., cover, shelter, etc.

(b) *Communications.* Consider the condition, availability, practicability and restrictions imposed by higher authority on roads, railroads, water routes, or other routes of communication as they affect the medical problem.

(c) *Weather.* Present and predicted weather, including moonlight if that be a factor in the medical problem.

(d) Other physical factors that should be considered.

(4) *Supply.* Amount and availability of supplies, sources of replenishment, and difficulties of supply distribution.

(5) *Physical condition of command.* Poor physical condition will multiply the number of casualties requiring evacuation during combat. Physical conditions may be affected by the origin of troops (urban or rural), presence of communicable diseases, food supply, water supply, proper clothing, fatigue, training, and many other factors.

(6) *Combat experience and morale* are also governing factors.

b. Analysis of situation. Analyze the elements in subparagraph *a* balancing the favorable against the unfavorable. This should include a discussion of the probable enemy reaction to our scheme of maneuver and the final disposition and location of the forces as a result of the action.

Note: A thorough understanding of the mission of the command and knowledge of the decision of the force commander is essential in making a medical estimate. The purpose of considering the tactical plan first in the estimate is to establish early the tactical basis of the medical task to be accomplished. Sufficient information regarding the combat strength and disposition of the enemy is usually available to the end that his probable reaction in reference to time and to contemplated action can be deduced. Only by full consideration and complete understanding of the tactical maneuver in all of its phases can the requirements in terms of medical service be planned for and provided as the action ensues.

(1) *Estimated number and probable distribution of casualties.* Estimate and record by localities the approximate number and type of casualties to be expected. This is a product of the combined influences of relative strength, enemy capabilities, own scheme of maneuver, physical, factors, morale and physical condition upon expectation shown in experience tables. (See Army Medical Bulletin No. 24, for casualty estimates).

(2) *Areas of casualty density.* From an analysis of the scheme of maneuver and the probable enemy reaction, locate approximately the areas where the greatest number of casualties can be expected, together with the approximate time of their incidence.

Note: In estimating the number and location of casualties all of the factors enumerated must be considered. Relative fire power and its effect upon casualty expectation, terrain features

favoring the effectiveness of enemy fire, and the effect and its extent on the casualty rate that any special advantages of our own force will have in offsetting the effectiveness of enemy fire should be considered here. The greatest number of casualties will ordinarily occur in those areas where the main or decisive effort is made. The units making the decisive effort, together with the location where it will occur, are usually mentioned in map problems or can be deduced from a study of the scheme of maneuver. In the attack, these areas are extended into the hostile position. In all units a study of the terrain, coupled with the location of enemy weapons is essential in locating areas where enemy fire will be most effective and will, therefore, produce the most casualties. These areas are known as *areas of casualty density*.

(3) *Available medical means.*

(a) *Organic medical means.* State the current status of the available medical means and its capabilities for further effort. Consider the following factors: The numerical strength and composition of the unit; the morale, physical condition and state of training; the condition of its equipment, including transportation; time and space factors in relation to its availability to the medical task.

(b) *Medical support.* Evacuation and other medical support by higher echelons not under control of own unit.

3. PLANS.

a. *Possible plans.* Under (1), (2) list all workable plans for a satisfactory medical support for the operation. Practicable plans should include those which may require an augmentation of means for their operation. One or more basic plans may have variants that can be stated in sub-paragraphs of the paragraph giving the basic plan.

b. *Analyses of plans.* Determine the practicability and weigh the advantages and disadvantages of each plan listed. Do not discard a practicable plan requiring an augmentation of means until it is certain that no reinforcements will be available.

Note: In studying any situation, two or more possible plans will present themselves. In order to select the best plan, a comparison of their values through the process of weighing the advantages and disadvantages of each against all others must be made. These plans must not only be practicable from a medical standpoint but also must be acceptable tactically and logistically. It is neither necessary nor desirable to discuss the minute details of any plan. The basic factors should be stated and discussed. In the division these will usually be restricted to the use of collecting and clearing units or to the location of aid station sites; in the corps, to the location of clearing stations; and in the army, to the movements of and the location of evacuation and surgical hospitals and medical regiments. Medical doctrines, principles of employment of medical units, and time and space factors, are all important items to be considered in the study of each plan in this paragraph. The discussion of the various plans should be so complete and logical that the best plan will be by contrast an easy choice. A satisfactory plan should be simple, comprehensive, and flexible.

4. DECISION.—A statement in concise terms of the *best* possible plan.

Note: The decision should be the final result of the discussion in paragraph 3. The conclusion arrived at by this process of reasoning is analogous to the basic decision of a commander and should include *what*, *when*, and *where* the task will be done. It forms the nucleus for the addition of any *supplemental* decisions necessary to complete the details of a complete plan. These supplemental decisions can often be made by the staff of the commander, if he so delegates authority. Situations will occur when, due to lack of information, all of the elements of what, when, and where the task will be done cannot be supplied—when this occurs the estimates should terminate with a conclusion only as complete as the situation at the specified time warrants. The scope of the conclusions, which is warranted by the situation must be determined in each case by the student.

Abbreviated Estimate of the Situation. When a decision must be reached rapidly, time will not be available for a complete written estimate of the situation. Nevertheless, it is imperative that the outline be followed mentally in the sequence described. Once an officer has schooled himself in the use of the complete form he will be able to select the most important considerations and arrive at a sound conclusion without a complete discussion or consideration of all the factors shown. A running estimate, constantly revised as events transpire, results in conclusions which are evolved element by element. The medical estimate will usually fall in this category in practice, as a planned medical service must be furnished a command continuously from the creation of the unit until its final dissolution.

THE UNIT PLAN

The basic plan for medical service is an essential part of the development of the estimate of the situation. Peculiar to the Medical Department and the other services, before orders for the employment of their units can be issued, those parts of their plans liable to interfere with plans of the other services or the arms and those that will be of interest to the command as a whole are submitted in the form of recommendations, as previously discussed, to the commander or his representative for approval.

The *medical plan* covers the recommendations for the employment of the unit as a whole. As an example the plan for the medical battalion will state the location of the collecting station or stations, the location of the clearing station, the location of the battalion command post and the headquarters detachment.

The *unit plan* is based on the medical plan and contains all details necessary for the operation of a subordinate unit. Each unit plan is prepared by the commander of the subordinate unit. This preparation is a command function and the unit plan does not ordinarily require approval of higher authority. The material contained in the unit plan is information that appears in paragraphs 2, 3, 4 and 5 of a written field order.

As an example the collecting station site and the ambulance routes to be used will be stated in the *medical plan*. From this information the collecting company commander develops the *unit plan* for the operation of the collecting company. This may include such details as: the arrangement of the various departments of the station at the site given, the distribution of the litter bearer squads, routes to be used as well as the method of litter evacuation, and the details for operation of the ambulance section such as location of relay posts in the shuttle, and the location of the basic relay post and the command post of the ambulance section. The commander cannot be expected to handle personally the innumerable details which constantly beset each unit in combat. The principal reason surgeons of higher echelons are furnished a staff is to relieve them of the burden of these details, which if given full attention would divert them from their principal responsibility, which is the supervision of the operation of the unit medical service. The impression should not be gained that a long period of time will elapse before orders for action can be issued. In instances where necessary, fragmentary orders will be issued as soon as parts of the plan are formulated and coordinated. Warning orders to subordinates should be issued early during the preparation of plans as this action saves time and will provide a general basis for the receipt of subsequent detailed orders. The ideal is that medical troops will never be delayed in accomplishing their part of the medical task by the absence of orders.

ORDERS

Purpose. Control of any military organization in battle or campaign is exercised through the medium of orders. An order is defined as the will of the commander conveyed to his subordinates. The contents of an order result, in principle, from the estimate of the situation which culminates in a decision and basic plan which, in turn, is followed by the development of supplemental or detailed plans. Hence, the "*order*" is merely the medium by which the contents of the detailed plan are communicated to the subordinates who will execute it. This does not mean that all orders are preceded by this complete process, since many orders involve supplementary or incidental instructions or administrative routine. It would be difficult to overemphasize the importance of clearly expressed, simply worded, grammatically sound phraseology. The novice in the art sometimes becomes unduly impressed with a need for "*canned*" language, or for the "*telegraphic*" style that omits, in order to obtain brevity, words which may be essential for understanding. The use of well-understood terms, of short, clear expressions, the avoidance of complex sentences, of brevity itself, are each important, but none are so important as *clarity* so that the subordinate who reads or hears the order will have no opportunity to misunderstand his mission. The subject is especially important to the medical officer on duty with troops in the field. He must be able to understand the orders which he will receive, and he must be able to issue the necessary orders to his subordinates in the exercise of his command function. The state of training of subordinate commanders has a direct bearing upon the extent to which

details of execution must be prescribed in orders; this important factor must be constantly considered. The ideal order is one that allows of no misunderstanding.

Classification. Orders may be divided into two general classes: routine orders and combat orders. *Routine orders* concern camp or garrison activities or administration, i.e., general orders, courts-martial orders, bulletins, circulars, and memoranda. *Combat orders* are those pertaining to operations in the field. They are classified as follows:

Letters of instruction.

Field orders.

Administrative orders.

Letters of instruction. Letters of instruction are issued by higher commanders, or the War Department, prescribing operations over large areas and for a considerable period of time. They deal with the broader phases of operations and are generally confined to stating the mission and the part each major unit is to play in its accomplishment. They are usually secret and the information contained is not for general distribution.

Field orders. Field orders are issued by a commander setting forth the military situation, the tactical mission and the plan of action decided upon, and such details as to the method of execution as will insure coordinated action by the whole command. They are designed to bring about a course of action, in accordance with the intention of the leader, which is suited to the particular situation and with the purpose of attaining full cooperation between all elements of the force. Field orders may (1) direct operations, or (2) warn of impending operations (warning orders). A warning order is a field order issued as a preliminary to an order which is to follow. Its object is to give advance information in order that subordinates can make timely arrangements to facilitate the carrying out of the order which is to follow. In the medical service, especially in the higher echelon units, their use is extremely important to proper functioning, due to the initial location of units usually far to the rear of the combat forces and the relative immobility of the larger medical installations.

Administrative orders. Administrative orders are used to announce to the command the administrative, supply, and evacuation details which are of interest to the command as a whole. In the division, the administrative order is prepared by G-4, in cooperation with G-1.

Preparation of Combat Orders. Scope. Combat orders announce the situation, state the purpose of the commander, and define the task that each next subordinate unit is to perform in the execution of this purpose. As combat orders are the expression of a fixed decision they must state definitely the end in view. Combat orders should not attempt to arrange matters too far in advance as this may lead to their recall and substitution. Such action lessens confidence in the commander, injures morale and is apt to impose unnecessary hardships on the command. Combat orders of an army recite the decision of the commander and assign the task each corps or other subordinate unit is to perform in carrying out the decision. Similarly, combat orders of corps assign the tasks of divisions, those of the division the task of regiments. Combat orders of the medical battalion assign the tasks of the separate companies. The orders of the surgeon of an infantry battalion assign tasks to the various groups or individuals of the battalion medical section.

Details of technique. (1) *Purpose.* Technique has only one object and that is to further the purpose of the combat order. It has no value or importance except as it accomplishes this object. It should never be degraded into a burden nor furnish an excuse for delay in the issuance of orders.

(2) *Amount of detail.* A complete order always contains three essential components: the situation, the mission of the command, and instructions regarding execution. The commander informs his subordinates, to the extent useful to them, of the situation of the enemy and friendly troops. The amount of detail in an order depends upon the composition, size, training of the force, the time available, the situation, and on the personality of the one issuing it and of those who are to receive it. The larger the force the more general will be the order. An order for a small or untrained unit will require more detail. When the transmission of orders involves a considerable period of time

during which the situation may change, detailed instructions are avoided in the order. The same rule applies when orders may have to be carried out under unforeseen circumstances. In such cases it is better to give general directions, stressing the object to be attained, but leave to subordinate commanders the choice of the means to be employed. For a march not in the presence of the enemy, all that need be given is the order of march, the initial point, the route, and the time of starting. On the other hand, for an attack, it is usually necessary, in addition to the decision, to give the line of departure, the direction and time of attack, the zone of action, the mission of each combat unit, and the axes of signal communication. The use of an operation map saves time in portraying these details.

(3) *Time.* The 24-hour clock is the official time system. Time is expressed as a group of four digits ranging from 0001 to 2400. The first two digits on the left are the hours after midnight, and the remaining two digits indicate the minutes past the hour. When the hour can be expressed by a single digit, it is preceded by zero (0); for example, 0625 is 6:25 A.M.

	12-hour system	24-hour system
12:01 A.M.		0001
7:05 A.M.		0705
Noon		1200
7:35 P.M.		1935
Midnight		2400

The date is expressed in either of two ways:

a. For the current month, the day may be indicated by preceding the four-digit time-group with a two-figure date-group indicating the day of the month. For example, 150600 is the fifteenth day of the month and the time is 6:00 A.M.

b. The date and time may be stated by using the four-digit time-group followed by the month, day and if desirable, the year, as for example, 0600 September 15, 1942.

When stating a night, both dates being included, the statement should read: night, September 15-16, 1942. In general, where the word "hour" is used, the word "time" should be substituted. A statement of date and hour should be expressed "time and date". If the order, message, dispatch, or report is sent by electrical means, the six digit time-date group will be used. Greenwich Civil Time (London) is used in all communications to or from the War Department, between headquarters not having a common local time, between Army and Navy, and between armed forces of the associated nations. This time (London) is designated by the letter suffix "Z" immediately following the last digit of the group, as for example, 151150Z indicates the fifteenth day of the current month at 11:50 A.M., Greenwich Civil Time. Unless the suffix "Z" follows the time-group, the time-group indicates a common local time.

(4) *Place.* Details of place should be stated in orders with extreme care and accuracy. Expressions depending upon the viewpoint of the observer, such as *right*, *left*, *in front of*, *behind*, *on this side*, *beyond*, and similar words and phrases are to be avoided; reference being made to points of the compass instead. The terms *right* and *left*, however, may be applied to individuals or bodies of troops, to boundaries of zones or sectors, or to the banks of a stream. In the latter case the observer is assumed to be facing downstream; in the other cases he is assumed to be facing the front (direction of the enemy). In all cases where these terms are used, the compass direction should be inserted in parentheses immediately following the word *right* or *left*, thus:

Right (east) boundary.

The hostile left (north) flank.

Geographic names are printed in capital letters. This minimizes the chance of error and makes the places mentioned stand out prominently in an order. There is one exception to this, viz, in the naming of maps in the heading of written field orders. The spelling in the order is the same as on the map used. When spelling does not conform to the pronunciations, the latter is shown phonetically in parentheses, thus: BICESTER (Bister), GILA (Hila).

All topographical features and places, which are at all difficult to find on a map should be identified by coordinates each time they appear in a different *subparagraph* of an order when the maps used are provided with grid lines, or by reference to prominent nearby points when the map is not gridded. When coordinates are used, geographical features or places named or numbered on the map may be identified by giving the coordinates of the *south-west corner* of the grid square in which they are located; those *unnamed* or *unnumbered* will be identified by giving the exact coordinates thereof, sufficiently close (according to the scale of the map) that they can be definitely identified.

A road is designated by its name, as the BALTIMORE TURNPIKE, or by connecting two or more names of places on the road with dashes, thus: the road: EMMITSBURG—FAIRFIELD—CASHTOWN. A road is similarly designated, thus: RJ 560 (361—749)—CR 403A(360—749)—RJ 458B(358—748)—GERMANTOWN.

Areas are designated by naming, *counterclockwise*, a suitable number of points delimiting them. The first point so named, regardless of whether the area pertains to friendly troops or to the enemy, is one on the right front from the viewpoint of our own troops.

Lines parallel (or nearly parallel) to the front and lines perpendicular, (or nearly perpendicular) (boundary between units) to the front are designated by naming points thereon in succession from right to left and rear to front respectively, from the point of view of one's own troops. In designating a boundary between units it is necessary to specify to which unit each point named on the boundary belongs. This is done in the case of zones of action or sector boundaries by placing the word *exclusive* or *inclusive* after the terrain features named, and in the case of boundaries between units by placing in parentheses after the terrain features named the designation of the unit to which they are assigned. For example:

Division zone of action:

East (right) boundary: TWO TAVERNS—M. Fink—RJ at (361.7-849.9)—NEWCHESTER (all incl).

WEST (left) boundary: WHITE RUN (excl)—GRANITE HILL (incl)—knoll at (359.8-754.2) (excl)—OAK GROVE S. H. (incl).

Boundary between regiments: LOW DUTCH ROAD (to 2d Inf)—GULDENS (to 1st Inf)—PINE CHURCH (to 1st Inf).

(5) *Designation of units.* The numerical designation of an army is written in full, as: *First Army*; of a corps in Roman numerals, as: *II Corps*; of a division or smaller unit in Arabic numerals, as: *1st Infantry Division, 3d Infantry, 1st Medical Regiment, 3d Medical Battalion.*

(6) *Legibility.* Written orders should be so plainly written as to be legible even in poor light. It must be envisioned that the reader may have but a candle or flashlight by which to read. Carbon and mimeographed copies should be checked before issue for legibility and correctness.

(7) *Language.* An order is faulty if it does not convey to the recipient the exact meaning and intention of the author. Exactitude of language is necessary, and consequently care in the choice of words is required. Vague and ambiguous orders indicate vacillation and the absence of definite decision on the part of a commander. Troops must be told in terms that are direct and unmistakable as to what their leader wants them to do. Combat orders should be brief but clarity should not be sacrificed to obtain brevity. Short and terse sentences are easily understood and therefore are preferable to long involved ones. Conciseness, brevity, and the use of simple English are paramount. Conjectures, expectations, reasons for measures adopted, and detailed instructions for a variety of possible events must be avoided as they weaken the force of an order and undermine confidence in the commander. The affirmative form of expression should be used, *e. g., "Headquarters Detachment will remain in GETTYSBURG"* is preferable to *"Headquarters Detachment will not accompany the battalion."* In the latter, the gist of the order depends on the word *"not"*. Such expressions as *attempt to care for, try to reach, as far as possible, if possible, as well as you can* should be

avoided. They tend to shift the responsibility for the decisions to the subordinate, which is incompatible with command. In combat orders technical military language should be used only when there will be no doubt that all subordinate officers have the training and experience to comprehend it. This applies to the use of the so called "canned language." Most of these technical terms can be clearly expressed in words of common understanding although a few more words may be necessary.

(8) *Abbreviations.* The purpose of using abbreviations is to save time, therefore they should be used when this purpose is served and not otherwise. The following are habitually used in writing orders:

RJ for road junction.

BM for benchmark.

No for number.

incl for inclusive.

CR for cross roads.

excl for exclusive.

Only authorized abbreviations are used. (See AR 850-150 and Field Manual 21-30, "Conventional Signs, Military Symbols and Abbreviations"). The use of abbreviations is not mandatory, except in listing annexes and in the distribution in the ending of orders. Periods are not used in writing abbreviations.

Field Orders. *General.* Every order issued for the purpose of governing the action of troops in the field in connection with a tactical situation is a field order. Field orders set forth the situation, the decision and general plan of action, and the tasks of subordinate units in such detail as will insure the proper operation of these units and coordination with the command. A field order may contain complete detailed instructions to a unit, or simply a statement of the task assigned, leaving to the initiative and resourcefulness of the subordinate the method of execution.

A prescribed form for field orders has been adopted to provide uniformity of issuing orders throughout the service, to insure that the plan of the commander is readily understood and that all essential instructions are included and to facilitate reference. If every commander who issued a field order should follow a form of his own choosing, no two of these forms would be the same. Confusion and misunderstanding would result and essentials would be overlooked. A standardized form is necessary in order that those receiving it may know exactly where to look for pertinent information and instructions. The current form for a field order has been developed as a result of experience and furnishes a clear and natural sequence of issuing instructions.

Sequence. All field orders have the same sequence, namely:

Paragraph 1. A concise word picture of the situation limited to information of the enemy and friendly troops, only to the extent that this information affects the subordinates.

Paragraph 2. A definite, clearcut, brief decision and plan for the command as a whole.

Paragraph 3. Instructions for each subordinate element of the command stated in such a way as to assure teamwork and unity of effort by the whole command.

Paragraph 4. Instructions governing the administration and supply of the command in the particular operation involved.

Paragraph 5. Definite arrangement for communication between the commander and subordinate commanders.

Preparation. The art of preparing a concise and understandable field order cannot be acquired over night. The development of proficiency is slow and requires painstaking work, through the medium of practice. Officers should take advantage of every opportunity in peace time to express tactical decisions in the form of field orders and these efforts should be closely supervised. The degree of clarity with which orders will be issued on the field of battle, where conditions will affect adversely the mental acuity of the commander, will be in direct proportion to the proficiency attained in the art through prior training and practice.

Some officers may issue orders from a map after a short period of study. However, until that state of proficiency is attained, the preparation of a field order should consist of the following steps:

(a) The planning of the operation on a map.

- (b) The blocking out on paper of the various paragraphs in standard sequence and the noting in each of the information or instructions to be given.
- (c) A thorough check of the draft to insure that no essential has been omitted.
- (d) Writing the order with all details arranged in proper order.
- (e) Final examination for completeness and clarity.

Methods of issue. (1) The commander (having evolved a plan of operation) must select the method to be used in issuing the field order. Depending upon how quickly the action must be initiated, the order will be issued orally, dictated, or written and in fragmentary or complete form. In general, the field orders of armies and corps are written; those of the division and regiments are fragmentary and in many instances are issued orally. The method of issue is a matter for determination by the commander in each case. The invariable rule is that the order must reach the lowest subordinate concerned in its execution in sufficient time to afford him a suitable opportunity to make his reconnaissance, plans, and to issue his orders prior to the hour set for the beginning of the action.

The wide use of radio, especially two-way voice radio, reduces the time required for the mechanical transmission of messages and orders. Further developments place emphasis on oral orders rather than the use of written field orders.

(2) Complete written field orders have the advantages of being accurate, of giving complete information, and of lessening the chances of misunderstanding. When the commander decides to issue fragmentary orders to initiate action these fragmentary orders are assembled into complete written field orders at the earliest opportunity and every effort made to have them available to subordinates prior to the beginning of the action. Regardless of whether the complete written field order can be issued or not prior to the action, it is formulated and issued without delay for purposes of record.

Fragmentary field orders. (1) In warfare of movement it will be unusual for divisions and smaller units to issue written field orders. The tactical requirement in moving situations that the forward movement of troops into combat be continuous, demands that orders be issued in fragmentary form. In units having greater mobility than infantry the issuance of fragmentary orders is mandatory.

(2) Fragmentary orders are prepared following the same sequence and technique prescribed for the written field order as permitted by the information and instructions to be furnished the subordinate. If it is desired to insure instructions which are contained only in paragraphs 2, 3, and 5 of a complete written field order, they are arranged in that sequence, and paragraphs 1 and 4 are omitted.

(3) Fragmentary orders may be issued orally, dictated, or written and whenever possible should be accompanied by an operation map or sketch. Orders may be transmitted by means of messengers, telephone, radio, or other methods. When issued other than written they should be followed as soon as possible by a written confirmation. When time and space factors permit, officers are used invariably for the delivery of fragmentary field orders to insure accuracy and reliable transmission.

Oral and dictated field orders. (1) Oral and dictated orders are similar in that both are spoken orders. Oral orders are not taken down verbatim, but notes are taken. The method of issue rests with the commander. He may say, "Copy this order," meaning a dictated order; or he may say "Take notes," meaning an oral order.

(2) The advantage of oral orders is the short time required for issuance. They have their particular application in rapidly changing situations. When an oral order is issued, a record is made of its provisions by the commander issuing it and by the subordinates receiving it for inclusion in the journals of their own units. When important orders are issued orally by a commander he furnishes to each subordinate receiving it a copy of the entry made in his own journal pertaining to the order.

(3) The dictated order is taken down verbatim. It then becomes a permanent, ready reference for later use, and the chances of error due to forgetfulness or misunderstanding are much less than in the case of oral orders. However, training of personnel in issuing and receiving oral orders will eliminate the need for dictated orders.

(4) The prescribed sequence of field orders must be adhered to strictly in issuing spoken (dictated or oral) field orders. The written order can be modified or otherwise

corrected before issue. The moment a commander changes his instructions during the course of a spoken field order he creates confusion, misunderstanding, and a lack of confidence as a commander by his apparent indecision and vagueness. In issuing spoken field orders the commander does not indicate where one paragraph begins and ends, but the subordinate writing the orders should do so. Subordinates are not responsible for words put into orders. They are responsible, however, that they carry away the correct meaning. This implies that the notes taken must be intelligible to others.

(5) The formulation of a field order which is to be issued orally is a delicate task requiring meticulous care for the best results. Before issuing an order of this type the commander must have his plan thoroughly crystallized. He should block out on paper the various headings and paragraphs of the order, noting the instructions to be given each subordinate unit. There are three methods possible of use in formulating and issuing oral and dictated field orders. The commander may write out the order in full and then read it to his subordinates; he may prepare notes and select the words of the order as he issues it; or he may issue it without notes. The first method is safest but can rarely be used due to lack of time. The second method is safe and the one most often used. The third method is a poor one and only mentioned to be condemned. Subordinates receiving orders should not be forced to erase, substitute, interline, or alter what they have already written.

(6) Spoken orders should be issued from an observation point where points and areas on the terrain in reference to similar places on the map and the contemplated action can be used to orient the subordinate. Orientation between the map and the terrain must be completely understood by all, especially if the order is couched in terms referring to points on the map. The pointing out of features on the terrain during the issuance of spoken field orders is good practice only when it is assured that the subordinate receiving that part of the order is not busy writing at the time. In issuing instructions to subordinate units, the official title of the organization or its commander should be used rather than the appellation "You." While there is more room for explanation to subordinates in the oral type of field order the need for explanation shows a lack of preparation and training either on the part of the commander or the receiver.

Complete written field orders. The form for the complete written field order prescribed for use throughout the service is divided into the following sections, each of which contains a certain assigned class of information or instructions.

The heading.

The body.

The ending.

(1) *Heading.* The heading contains the *title*; the *place*, *time* and *date* of issue; the number of the order; and reference to the map used.

(a) *Title.* The title appears in the upper right hand corner of the first page. It is the official designation of the command; as, 1st Medical Battalion. It may, where circumstances require, be written in code.

(b) *Place of issue.* Appears in the same corner and on the line next below the title. Because of the need for secrecy, it may be omitted.

(c) *Time and date.* The 24-hour time system is used, beginning at midnight, and ending at night. (See subparagraph under preparation of combat orders of this chapter).

(d) *Number.* The number of the order appears in the upper left corner of the first page. Field orders of a command are numbered consecutively for the period of the war.

(e) *Map reference.* The map reference appears next below the number of the order and designates the map(s) required, giving the scale, the names of sheets, and the year of edition (when necessary), in sufficient detail to identify the exact map(s) used in the preparation of the order. When an order is accompanied by an operation map which is complete within itself, the reference is: Map: Operation Map (Annex).

Example

1st Medical Battalion
TANEYTOWN, MD
1630, September 15, 1942.

FIELD ORDERS

No. 6

Maps: General Map, Gettysburg (1925), 1 inch equals 5 miles. Topographical Map, Gettysburg-Antietam (1925), 1: 21,120, Bonneauville and Gettysburg sheets.

(2) *Body*. The body of the field order contains the information and instructions for the command in the following order:

(a) *Paragraph 1*. Information—include appropriate information of hostile and friendly forces. This is divided into two subparagraphs, a and b.

(1a) *Enemy*. Composition, disposition, location, movements, strength; identifications; capabilities. Refer to intelligence summary or reports when issued.

(1b) *Friendly forces*. Missions, or operations, and location of next higher and adjacent units; same for covering forces or elements of the command in contact; support to be provided by other forces.

Example

1. a. Enemy force is estimated to be an infantry regiment reinforced by light artillery. Cavalry is protecting the right (south) flank. It is believed the hostile force will take up a defensive position on the high ground southeast of GETTYSBURG, pending the arrival of the remainder of the hostile division known to be at YORK.

1. b. The 1st Infantry Division will attack and secure the line ROCKY GROVE SCHOOL (353-750)—WOLFE HILL (352-748).

Formation. 1st and 2d Infantry abreast, 2d Infantry on the right. Boundary between regiments. STATE HIGHWAY 231 (all to 2d Inf.) Line of Departure. RJ 531-C (354-750)—CR523B (352-746). 701st Surgical Hospital will be established adjacent to clearing station by 0700 September 16, 1942.

Evacuation by army commences 0900 September 16, 1942.

(b) *Paragraph 2*. Decision or Mission. Decision or mission; details of the plan applicable to the command as a whole and necessary for coordination.

Example

2. This battalion moving into assigned position at 2000, Sept. 16, 1942, will provide medical support for the division during the attack.

or

2. See operation map, Annex 1, accompanying this order.

Troops. Composition of tactical components of the command, if appropriate. Its use generally is limited to march, advance guard, rear guard and outpost orders, and to the first field order issued by a newly created command. (This follows paragraph 2 of the order, without number).

(c) *Paragraph 3*. Tactical Missions for Subordinate Units. Specific tasks assigned to each element of the command charged with execution of tactical duties, which are not matters of routine or covered by standing operating procedure. A separate lettered subparagraph for each element to which instructions are given.

Subparagraph x. Instructions applicable to two or more units or elements or to the entire command, which are necessary for coordination but do not properly belong in another subparagraph.

Example

3. a. Company A will follow Combat Team 1 and establish collecting station in vicinity of RJ 458-J (354-746).

b. Company B will follow Combat Team 2 and establish collecting station in the vicinity of MT. VERNON SCHOOL (356-748).

c. Company C will move at once to LITTLESTOWN (363-739) and remain in battalion reserve.

d. Company D will establish clearing station in LITTLESTOWN.

x. (1) All movements will be made without lights and be completed prior to daylight.

(2) Secrecy will be maintained.

(3) All units will be at station at 2100.

or

3. a. See overlay operation map, annex 1.

(d) *Paragraph 4*. Administrative Matters. Instructions relative to tactical units

concerning supply, evacuation, and traffic details which are required for the operation (unless covered by standing operating procedure or administrative orders; in the latter case, reference will be made to the administrative order).

Example

- a. The Headquarters Detachment will follow Company D without distance to LITTLESTOWN and establish unit and medical distributing points in the vicinity of the clearing station.
- b. Medical Supply Point: UNION MILLS (369-730).
- c. Ambulance routes: (See Overlay)

(e) *Paragraph 5.* Signal Communication. Divided into two subparagraphs.

(5a) Orders for employment of means of signal communication not covered in standing operating procedure. Refer to signal annex or signal operation instructions, if issued.

(5b) Command posts and axes of signal communication. Initial locations for unit and next subordinate units; time of opening, tentative subsequent locations when appropriate. Other places to which messages may be sent.

Example

- a. Division surgeon's office: GETTYSBURG (350-750) opens at 1930.
- b. Command Post: 1st Medical Battalion, LITTLESTOWN (363-739) opens at 2000.

(3) *Ending.* The ending contains the signature, authentication (except on the original), a list of annexes, if any, and a statement of the distribution.

(a) *Signature.* The field order is signed by the commander or his principal staff officer—customs differ in this respect. When signed by other than the commander the expression "By Command of" or "By order of" (when other than a general officer commands unit) should be placed directly above the signature. The signature is placed toward the right hand side of the page, immediately following the body of the order, and consists of the signer's name, rank, corps or arm (except for general officers) and office (Commanding, Chief of Staff, or Executive Officer).

(b) *Authentication.* The authentication of copies of the order is made by the staff officer responsible for the preparation of the order. In the medical battalion, this is usually the Plans and Training Officer (S-3). It is placed on the left hand side of the page immediately following the body of the order and consists of the word "Official" followed by the signature, rank, corps, or arm, and office of the authenticating officer.

(c) *Annexes.* Whenever the detailed instructions for the operation of any service or other component of the division or higher unit are too long to be included in the field order, an annex containing these instructions is prepared by the staff officer concerned and submitted for approval to the commander. These, when approved, become annexes to the field order. They are signed by the chief of staff or executive in the manner prescribed in (a) above, and the original and all copies are authenticated by the appropriate staff officer as indicated in (b) above. Annexes to the same field order are numbered serially in the sequence in which reference is made to them in the order. In the medical battalion it is usual to have but one annex, that being an operation map. The list of annexes appears just below the authentication. It consists of the title and serial number of each.

(d) *Distribution.* A statement showing the distribution of the order is essential as a check to insure that each officer and unit directly concerned with the execution of the order receives a copy. This statement may be in detail or reference made to a standard distribution list (e.g., "Distribution A") already adopted, which shows in detail the distribution used. Each copy of a combat order is usually numbered and a record kept showing the specific copy numbers distributed to each officer or unit. The distribution is shown immediately following the list of annexes.

Example

By order of Lt. Colonel "A"

"X"

Major, Medical Corps
Executive Officer

OFFICIAL:

"Y"

Major, Medical Corps,
Plans and Training Officer (S-3)

Annex 1—Overlay of Operation Map.

Distribution:

..... C of S
 G-1
 G-2
 G-3
 G-4
 Div Surg
 Div Arty
 Hq Co., Div
 MP Plat
 Sig Co
 Rcn Tr
 QM Bn
 Engr C Bn
 1st Inf
 2d Inf
 3d Inf

..... Med Bn
 CO, Med Bn
 Hq Det
 Co A
 Co B
 Co C
 Co D
 Surg Hosp
 Surg, Army
 Surg, Corps
 File
 Diary

Distribution: A

Operation Map. An operation map is a graphic presentation of a commander's decision and tactical plan placed upon a map through the use of authorized abbreviations and conventional signs. It consists of that part of a field order which can be shown graphically on a map in such detail as will not be confusing. It shows the important details of known enemy dispositions at the time the map is prepared and the contemplated dispositions and plans of action of our own troops, in so far as this information can be graphically shown without destroying its legibility.

With the modern means available for the transport of troops in the combat zone there is a direct necessity for increased speed and accuracy in the issuing of field orders. The tendency toward error is greater as the time available for issuing orders is reduced, hence the need for development of simple methods and means in the process of issuing orders. The graphic method of presenting the ideas and intentions of a commander on a map is considered the greatest aid as yet developed in the simplification process. A few lines on the map, carefully set down, will depict a situation much better in every way than a long paragraph in a written order that must be read and then staked out on a map before the reader can gain an insight into the situation.

In the preparation of operation maps, the following points should be observed:

- (1) The meaning of all data shown must be unmistakable.
- (2) Military symbols and authorized abbreviations should be used. If other symbols are used a legend explaining them must be included.
- (3) Legibility is paramount. The amount of detail possible of depiction is controlled by this factor.
- (4) When colors are used data relating to enemy troops or operations are shown in red, and similar data for friendly troops in blue.
- (5) The operation map must have a title showing that it is an annex to the field order that it accompanies, the office of issue, place of issue, time and date of issue. It is signed by the principal staff officer (Executive Officer in the medical battalion) and authenticated by the G-3 or S-3 as the size of the unit dictates. In the use of overlays a map reference in addition to the above is essential for orientation.
- (6) Before issue, it should be carefully checked, in conjunction with any written part of the field order, for completeness and accuracy.

Overlay. An overlay is a sheet of transparent paper on which information is placed by means of abbreviations and military symbols (with a minimum of written information) to be used in conjunction with a map. The intersection of two sets of coordinates must be included on the overlay to enable the user to apply the information to his own map in correct positions.

The "staking out" of a military situation consists of placing information in its proper position on a map (generally by the use of colored pencils). This information is obtained in connection with the progress of an operation, or from data contained in orders. This information is placed on the map as it is obtained, and shows the situation at a particular time. This is called a "*situation map*."

A *sketch* is of value when maps are not available to the subordinate receiving the order. A sketch shows prominent terrain features, roads, houses, etc., drawn to a correct scale and direction, the latter being indicated on the sketch.

Standing Operating Procedure. The use of standing operating procedures will have an important effect upon the extent of the detail included in orders. The purpose of standing operating procedure is:

- (1) To simplify and abbreviate combat orders and expedite their transmission.
- (2) To simplify and perfect the training of troops.
- (3) To promote understanding and teamwork between the commander, staff and troops of the same or combined arms and services.
- (4) In general, to facilitate and expedite operations and minimize confusion and errors. (See Chapter V, Part I).

Administrative Orders. Administrative orders are issued by armies, corps, divisions, and smaller independent commands when the administrative details of interest to the command as a whole are too voluminous to be contained in paragraph 4 of the field order. They are formal orders and follow a prescribed form. The administrative order is based on the administrative plan of the commander which is controlled by the tactical plan for the operation and the administrative plans and orders of higher authority. Their object is to outline the operations of the several technical, supply, and administrative services; to coordinate their activities; and to transmit to the command the commander's plan of administration. Administrative orders may be complete in themselves or accompanied by annexes. The "Medical Plan" is included in the administrative order of the command.

Note: For further details relative to orders the student is referred to Field Manual 101-5, "The Staff and Combat Orders."

MEDICAL REFERENCE DATA

The forms, outlines, and other data supplied below have been selected from publications of the Medical Field Service School where they are used as the basis for the solution of school problems. They are especially useful as guides and check lists; they are intended for these purposes only.

CHECK LIST OF A COMPLETE FORMAL MEDICAL PLAN (DIVISION)

1. SUPPLY.
 - a. Medical supply point(s). Location, hour of opening or closing, organizations served.
 - b. Other medical supply matters. Recommendations concerning policies and general instructions to be issued.
2. EVACUATION.
 - a. Casualties. Pertinent data regarding the following installation(s) such as location, units served, hour of opening or closing.
 - Collecting station(s).
 - Clearing station(s).
 - b. Burial. Arrangements for burial of the dead at medical installations.
 - c. Salvage. Arrangements for the disposition of clothing and equipment of casualties, left in medical installations.
 - d. Prisoners of War.
 - (1) Arrangements for security of sick and injured PW.
 - (2) Utilization of able-bodied PW to augment the medical service.
 - e. Other evacuation matters. Such as evacuation policy, special instructions to lower echelons, etc.
3. TRAFFIC.
 - a. Circulation. Special priorities desired for ambulances or other medical transport.

b. Construction and maintenance of routes. Necessary construction and maintenance of roads and bridges in the vicinity of medical installations or for use in evacuation.

4. TRAINS.

Recommendations with reference to movement of medical units on the march, release from march control, and control in bivouac.

5. PERSONNEL.

- a. Stragglers. Arrangements for the disposition of stragglers and malingerers in medical installations.
- b. Mail. Arrangements for postal service for medical units and installations.
- c. Shelter. Shelter required for medical units and installations.

6. MISCELLANEOUS.

- a. Attachment of medical troops. Instructions desired with reference to attachment of medical units to subordinate units.
- b. Movement of medical units. Instructions desired covering changes of location of medical units in rear areas.
- c. Arrangements with higher echelon for evacuation. The arrangement desired.
- d. Sanitation. Any instruction concerning sanitation which should be published.
- e. Medical matters not otherwise covered.
- f. Other medical details. No change (when applicable).

NOTE: Many of the above details will be covered in Standing Operating Procedure (SOP).

A FORM FOR AN ORDER FOR A MEDICAL BATTALION DURING COMBAT

Title
Place
Time, month, day, year.

FIELD ORDER

NO.

Maps:

1. Information.

a. Enemy—location, strength, composition, and other pertinent facts sufficient for a clear comprehension of the enemy picture by subordinates. Refer to operation map if one is used.

b. Friendly troops—position and mission of combat units; general plan of the division for the action, including: mission; formation; zone of action (when given); time of attack; scheme of maneuver; line of departure; boundary between regiments (combat teams); artillery positions and such other information as is pertinent. Supporting medical units (army evacuation, surgical hospitals, medical refilling points). Make proper reference to operation map if used.

2. Decision of battalion commander—usually to furnish medical support to the division for the particular action. If all organizations are to begin movement into position at the same hour it should be stated here; otherwise, the hour of movement of each subordinate unit should be stated in paragraph 3.

3. a. Instructions for Company A—to include movement, route(s), mission, location of collecting station(s), direct service to artillery, cavalry, or other unit, movement of foot troops.

b. Instructions for Company B—to include movement, route(s), mission, location of collecting station(s), direct service to artillery, cavalry, or other unit, movement of foot troops.

c. Instructions for Company C—to include movement, route(s), mission, location of collecting station(s), direct service to artillery, cavalry, or other unit, movement of foot troops.

d. Instructions for Company D—to include movement, route(s), establishment of clearing station(s), number of platoons to be active.

e. Instructions regarding battalion reserves—may be one company, platoon or section, with location and any movement of units necessary.

x. Instructions applicable to two or more units or to entire battalion which are necessary for coordination but do not properly belong in another subparagraph; such as: secrecy measures, hour of completion of movements into position, priority or restrictions on roads, time of opening of installations, time of closing of stations or time of relief of units.

4. a. Instructions for the Headquarters Detachment—to include movement, route, location of distributing point, with pertinent instructions of supply status, either general or medical, is other than normal.

b. Location of rear echelon.

c. Ambulance routes.

5. a. Location of the Command Post.

b. Location of division surgeon's office.

(Signature)

(Authentication)

Annex: (If operation map, overlay, etc., is used mention here.)

Distribution:

TIME AND/OR VEHICLE REQUIREMENTS FOR EVACUATION PURPOSES

Time requirements for evacuation. The following time requirements will serve as a guide:

For men:

For round trip evacuation (including loading and unloading)—

Litter squads: 1000 yards in 1 hour (Total 2000 yards)

Wheeled litters: 1000 yards in 45 minutes (Total 2000 yards)

Motor ambulances: 10 miles per hour (Total 20 miles)

Animal-drawn ambulances: 4 miles per hour (Total 8 miles)

To calculate the time required for evacuation of wounded men from the field, or the number of ambulances required to evacuate casualties in a given time, use the following formulae:

W—Number of sick and wounded.

N—Number of patients per load.

t—Time required for round trip.

T—Time required or allowed.

M—Number of vehicles or litters.

$$T = \frac{Wxt}{MxN}$$

$$M = \frac{Wxt}{TxN}$$

For animals:

For round trip evacuation (includes tying and untying)—

Lead line: 1000 yards in 30 minutes (Total 2000 yards).

Vehicular requirements for evacuation (capacities)—

Vehicles	Men		Animals
	Sitting	Recumbent	
Ambulance, animal-drawn	8	4	
Ambulance, ¾-ton 4 x 4	7	4	
Ambulance, mobile ward (proposed)	23	12 ¹	
Truck, ¼-ton, 4 x 4	2	2	
Truck, ¾-ton, weapon carrier	8	4 ²	
Truck, 1½-ton, 4 x 4	15	10 ³	
Truck, 2½-ton, 4 x 4	17	18 ⁴	
Railway car, Coach	88		
Pullman car, 12 section	48	24	
16 section	64	32	
Hospital Train		360 ⁵	
Ward car, Hospital train		36	
Ambulance, veterinary, motor			
Trailer, 2-wheel			2
Semi-trailer, 6-ton			8
Stock car			12
Box car			12
Veterinary lead line (2 60-foot lines)			20

¹ 5 sitting cases additional.

² With inserts.

³ In tiers suspended by side rail assembly with 2 litters on floor.

⁴ In tiers suspended by side rail assembly with 6 litters on floor.

⁵ This figure is variable depending upon type of cars which make up the train.

⁶ Normal capacity (see T/O 8-520, April 1, 1942).

CLASSIFICATION OF SICK AND WOUNDED FOR EVACUATION PURPOSES

(Figures are based on World War I)

1. The following table has been developed from American experience in active operations in World War I:

Battle casualties, including killed, in percent of unit strength

Unit	Average for all days in line	Severe battle day	Maximum battle day
Infantry Regiment	2.5%	12-15%	35%
Division	1.0%	6-8%	12%
Corps	0.5%	2-3%	5%
Army	0.2-0.35%	0.7-1.5%	2.5%

2. In estimating battle casualties in an army, an estimate based on front-line divisions engaged will usually be more accurate than if based on a rate for corps or army as a whole.

3. The battle casualties of an entire expeditionary force or theatre of operations can best be estimated by using the rates incurred in the component divisions or armies, as the relative proportion of front-line troops to the total force will vary widely in each situation.

4. The following data relative to battle casualties are approximately accurate for a severe engagement and can be used as a basis for calculations:

(a) In Temperate and Tropical Zones, the ratio of killed to wounded is as follows:

Open operations	about 1:5
Trench operations	about 1:4

Hence from 16½% to 20% of all battle casualties may be expected to be classed as killed. In the Arctic Zone, the ratio of killed to wounded will be considerably higher due to death of the wounded from exposure to cold.

(b) The transportation requirements for battle casualties of a division are as follows:

Dead	20%
Able to walk to the collecting station, but requiring transportation (sitting) to the rear	40%
Require transportation (recumbent)	40%
Of all casualties, about 1% are nontransportable beyond the surgical hospital, except by air	
Total	100%

Note: The foregoing indicates that the estimation of probable casualty rates in advance is not a simple matter that can be reduced to a general formula. While casualty expectancy tables have been prepared and are being used for purposes of instruction in service schools, it must be understood that such tables bear no closer relationship to actual experience than do map problems to actual combat.

Casualty Table from Bulletin No. 24 "War Casualties and their relation to Medical Service and replacements" by Colonel Albert G. Love, M. C.

General Types of Operation	1			2			3			4			5				6				7			
	Infantry Units Below Division			Artillery			Cavalry			All Other Arms and Services			Front Line Division Reinforced Division				Corps and Army Troops (except Cavalry)				Combat Troops in Corps and Army Reserves			
	To Dead	Clr Sta	Gen Hosp	To Dead	Clr Sta	Gen Hosp	To Dead	Clr Sta	Gen Hosp	To Dead	Clr Sta	Gen Hosp	To Dead	Clr Sta	Gen Hosp	Dead	To Dead	Clr Sta	Gen Hosp	Dead	To Dead	Clr Sta	Gen Hosp	Dead
Attack in a Meeting Engagement	16.0	80.0	1.9	9.3	1.2	16.2	16.0	11.0	1.3	6.5			6.0	32.4	32.0	27.0	0.6	6.6	6.5	4.5	0.3	6.6	6.5	4.5
Attack of a Position: First Day of Attack	25.0	125.0	2.9	14.5	2.0	20.4	20.0	14.0	2.0	10.1			10.0	51.0	50.0	42.0	1.0	10.2	10.0	77.0	0.5	7.5	7.5	5.3
Succeeding Days	12.0	62.0	1.4	7.3	1.0	15.3	15.0	10.4	1.0	5.1			5.0	25.5	25.0	21.0	0.5	7.1	7.5	5.2	0.3	6.4	6.3	4.4
Attack of a Zone: First Day of Attack	42.0	210.0	4.9	24.3	3.2	27.5	27.0	19.0	3.4	17.0			17.0	85.7	84.0	70.0	1.6	13.7	13.4	9.4	0.8	9.4	9.2	6.4
Succeeding Days	21.0	105.0	2.4	12.2	1.6	18.4	18.0	12.5	1.7	8.5			8.0	42.8	42.0	35.0	0.8	9.2	9.0	6.3	0.4	7.1	7.0	4.9
Pursuit	8.0	42.0	0.9	4.9	0.6	13.3	13.0	9.0	0.6	3.4			3.0	17.4	17.0	14.0	0.3	6.6	6.5	4.5	0.2	5.9	5.8	4.1
Combat and Covering and Security Forces	6.0	30.0	0.7	3.5	0.4	12.8	12.5	8.5	0.5	2.4			2.0	12.3	12.0	10.0	0.2	6.3	6.2	4.3	0.1	5.7	5.6	3.9
Defense in a Meeting Engagement	10.0	50.0	1.2	5.8	0.8	12.8	12.5	8.5	0.8	4.1			4.0	20.4	20.0	17.0	0.4	6.3	6.2	4.3	0.2	5.7	5.6	3.9
Defense of a Position Against Attack: First Day of Defense	15.0	60.0	1.1	7.0	1.0	15.3	15.0	10.0	1.2	4.8			6.0	24.5	24.0	23.0	0.5	7.7	7.5	5.2	0.3	6.4	6.3	4.4
Succeeding Days	7.5	30.0	0.9	3.5	0.6	11.2	11.0	8.0	0.6	2.4			3.0	12.3	12.0	11.5	0.3	5.8	5.7	3.9	0.15	4.9	4.8	3.3
Defense of a Zone: First Day of Defense	25.0	100.0	2.9	11.6	2.0	18.4	18.0	12.5	2.0	8.1			10.0	40.8	40.0	33.0	1.0	9.2	9.0	6.3	0.5	7	7.0	4.9
Succeeding Days	12.5	50.0	1.5	5.3	1.0	13.3	13.0	9.5	1.0	4.0			5.0	20.4	20.0	18.0	0.5	6.7	6.6	4.8	0.25	5	5.3	3.6
Periods of Stabilized Defense	5.0	20.0	0.6	2.3	0.4	12.2	12.0	8.5	0.4	1.6			2.0	8.2	8.0	7.0	0.2	6.1	6.0	4.2	0.1	5	5.5	3.9
Retirement and Delaying Action	4.0	20.0	0.5	2.3	0.4	12.2	12.0	8.5	0.3	1.6			2.0	8.2	8.0	7.0	0.2	6.1	6.0	4.2	0.1	5	5.5	3.9

Under conditions of campaign not enumerated above casualty rates for men will be approximately the same for all troops.

The following rates will be assumed: Dead, negligible; To clearing station, 4.5 per 1000; evacuation from clearing station to evacuation hospital, 2.5 per 1000; from evacuation hospital to general hospital, 1.5 per 1000.

NOTES:

1. Disregard enemy casualties abandoned on the battlefield unless specifically called for in the statement of the requirement.
2. The factors given in the above table are intended for school purposes only.

DAILY LOSSES OF ANIMALS FROM ALL CAUSES IN CAMPAIGN PER 1000 OF ACTUAL STRENGTH
Casualty Table from Bulletin No. 24—"War Casualties and their relation to Medical Service and replacements" by Colonel Albert G. Love, M. C.

General Types of Operation	1			2			3			4			5		
	Infantry, Artillery and Other Units			Cavalry			Front Line: Division in Corps or Reinforced Division			Corps and Army Troops (except Cavalry)			Combat Troops in Army Reserve		
	To Vet Sta	To Vet Clr Sta	To Vet Gen Hosp	To Vet Sta	To Vet Clr Sta	To Vet Gen Hosp	Dead	To Vet Sta	To Vet Clr Sta	To Vet Gen Hosp	Dead	To Vet Sta	To Vet Clr Sta	To Vet Gen Hosp	To Vet Sta
Attack in a Meeting Engagement	32.0	40.0	5.0	17.6	16.0	2.0		12.0	17.6	16.0	3.0	1.2	4.4	4.0	0.6
Attack of a Position: First Day of Attack	50.0	62.5	8.0	22.0	20.0	3.0	20.0	27.5	25.0	5.0	5.0	2.0	5.5	5.0	0.7
Succeeding Days	24.0	31.0	4.0	16.5	15.0	2.0	10.0	13.7	12.5	2.0	2.0	1.0	4.1	3.7	0.5
Attack of a Zone: First Day of Attack	84.0	105.0	13.0	29.7	27.0	4.0	34.0	46.2	42.0	7.0	3.2	3.2	7.4	6.7	0.9
Succeeding Days	42.0	52.5	7.0	19.8	18.0	3.0	16.0	23.1	21.0	4.0	1.6	1.6	5.0	4.5	0.6
Pursuit	16.0	21.0	2.5	14.3	13.0	2.0	6.0	9.4	8.5	2.0	0.6	0.6	3.5	3.2	0.5
Combat of Covering and Security Forces	12.0	15.0	1.5	13.2	12.0	2.0	4.0	6.6	6.0	1.0	0.4	0.4	3.4	3.1	0.4
Defense in a Meeting Engagement	20.0	25.0	3.0	13.2	12.0	2.0	8.0	11.0	10.0	2.0	0.8	0.8	3.4	3.1	0.4
Defense of a Position Against Attack: First Day of Defense	30.0	39.0	4.0	16.5	15.0	2.0	12.0	13.2	12.0	3.0	1.0	1.0	4.1	3.7	0.5
Succeeding Days	15.0	15.0	2.0	12.1	11.0	2.0	6.0	6.6	6.0	2.0	0.6	0.6	3.1	2.8	0.4
Defense of a Zone: First Day of Defense	50.0	50.0	8.0	19.8	18.0	3.0	20.0	22.0	20.0	4.0	2.0	2.0	5.0	4.5	0.6
Succeeding Days	25.0	25.0	4.0	14.3	13.0	2.0	10.0	11.0	10.0	2.0	1.0	1.0	3.6	3.3	0.5
Periods of Stabilized Defense	10.0	10.0	1.5	13.2	12.0	2.0	4.0	4.4	4.0	1.0	0.4	0.4	3.3	3.0	0.4
Retirement and Delaying Action	8.0	10.0	1.5	13.2	12.0	2.0	4.0	4.1	4.0	1.0	0.4	0.4	3.3	3.0	0.4
Under All Other Conditions of Campaign															

The following rates will be assumed: Dead, negligible; Evacuation from veterinary collecting stations to evacuation hospitals, 1.25 per 1000; From evacuation hospitals to general hospitals, 0.1 per 1000.

NOTES:

1. Disregard enemy casualties abandoned on the battlefield unless specifically called for in the statement of the requirement.
2. The factors given in the above table are intended for school purposes only.

CHAPTER VIII

ADMINISTRATION

Purpose of Chapter. This chapter includes useful information about the subject of Administration. Units of the Medical Department maintain the same records for their personnel, supply, mess, correspondence, and other administrative requirements as all branches of the Army. In addition, the department maintains records of the utmost importance which pertain to the execution of its own professional functions.

The officer of any corps of the Medical Department must prepare himself to perform efficiently many duties in addition to his purely professional functions. He may, for example, be required to exercise command of a medical detachment, a unit of a medical battalion, or a hospital; in the performance of such missions he is confronted with problems of leadership, organization, mess and supply, training, discipline and morale, as well as administration. To the same extent as all other officers he may sit as a member of a military court or of a board of officers. He may be assigned to duty as executive or adjutant of a medical command. Thus, the officer within the Medical Department must be ready for a diversification of responsibilities of which his brother in civilian practice may be entirely unaware.

The student of administrative procedures does well to become imbued at the outset with the need for absolute accuracy in the records which he will prepare. Many are records of original entry and become the basis for other compilations, analysis, and summaries. They must contain the truth. Further, similar records must be prepared alike in all organizations, for otherwise no reliable comparisons can be drawn therefrom. The language or phraseology used is important. Unless exact phrasing is prescribed (as in the case of entries in the morning report) there is no acceptable substitute for good, clearly expressed, grammatical English, legibly recorded, which will impart the same meaning to all readers. Battles are not won by records and "paper work." Still, the winning of battles may be simplified by having men, munitions, and transportation in necessary quantities at the right place at the time required. All this requires good administration and accurate records. It is an important part of good staff work which is vital to the commander for the efficient exercise of command. Skill in required administrative procedures is an important part of officer-training, and in this training accuracy, completeness, and clarity must be obtained.

MEDICAL DEPARTMENT ADMINISTRATION

Medical Department administration is the management of the *medical activities* of a military command, rather than the supervision of the affairs of the department itself. In the various types of Medical Department installations and units (*e.g.*, the fixed hospital of the zone of the interior or the mobile units of the combat zone) details of administrative procedure may vary, but the broad principles remain applicable in all situations. While certain Army Regulations are epitomized, the text is not a complete abstract of them; neither will it completely replace Army Regulations and Manuals as a reference for the accomplishment of records, reports, and returns by medical officers. No effort has been made to reproduce more than a few of the many blank forms employed, though they are frequently referred to by name and number. The printed instructions on the blank form itself are detailed and specific and should always be consulted. An attempt has been made to explain essential duties of Medical Department officers and the means and methods of administering Medical Department activities. Some of these may be termed customs of the service inasmuch as they are not covered by Army Regulations.

The duties of medical officers as such are three-fold in character: *professional*—duties incident to the practice of medicine, including physical examinations for the preservation and promotion of health; *advisory*—duties pertaining to a medical officer as a staff officer; and *administrative*—duties pertaining to a commander of medical department personnel

and establishments and the patients therein. In addition, officers of the Medical Department serve as members of courts-martial and boards of officers.

The duties of the dental officers as such are similar to the medical officers in their profession; however, their duties are included within the responsibility of the medical officer who is in command of the medical establishment or unit.

The duties of the veterinary officers as such are usually professional and advisory. These include the preservation and promotion of the health of Army animals and the inspection of food and forage as purchased for the Army by the Quartermaster. The administrative duties of the Veterinary Corps are limited to those units within the veterinary establishment or unit—the unit surgeon or commanding medical officer is responsible in his absence.

The duties of the Medical Administrative Corps officers are purely administrative. Their services are intended to assist the other Medical Department officers in the administration of Medical Department affairs. Medical Administrative Corps officers who are qualified as pharmacists may in addition serve in that capacity in hospital pharmacies.

Titles of Medical Officers. The title of the senior medical officer at general headquarters or with an expeditionary force is "chief surgeon." The senior medical officer with any non-medical command, except as prescribed above, is designated as "surgeon," thus:

Command	Staff	Official Address
Service command	Surgeon	The Surgeon, Second Service Command .
Post, camp, or station	Station Surgeon	The Surgeon, Fort
Army Transport	Transport Surgeon	The Surgeon, U.S.A.T.
Army	Army Surgeon	The Surgeon, First Army
Corps	Corps Surgeon	The Surgeon, II Corps
Division	Division Surgeon	The Surgeon, Fifth Armored Division . .
Regiment (except medical regiment) .	Regimental Surgeon	The Surgeon, Eighth Infantry
Battalion (except medical regiment and medical battalion)	Battalion Surgeon	The Surgeon, Second Engineer Battalion.

The senior medical officer of a general hospital, dispensary, or other separate medical unit is designated as commanding officer, *e.g.*, "The Commanding Officer, 32d Medical battalion, Carlisle Barracks, Pennsylvania." Although the senior medical officer at a station may be the commanding officer of the hospital, he is referred to as the surgeon in order to distinguish him from the commanding officer of the garrison or component units therein.

Functions of a Staff Medical Officer. There is normally a staff medical officer for each command larger than a company. The senior medical officer present for duty with the command is, in addition to his other duties, the staff medical officer. The basic title of a staff medical officer is "surgeon" which, as commonly used in the military service, indicates his staff or advisory position rather than his professional qualifications and is analogous to such terms and positions as quartermaster, adjutant, etc. The duties of "the surgeon" are advisory and administrative; advisory in his relations as a staff officer and administrative in his conduct of the medical department as a technical and supply service under the control of his commanding officer. See Chapter III, "Duties of the Division Surgeon."

Duties in Connection With the Dental Service. The dental service is a specialized branch of the medical service. As such it is controlled by the surgeon. In the absence of a dental officer the surgeon may, under certain conditions, obtain the services of civilian dentists.

Duties in Connection With the Veterinary Service. While appropriately united in one department and administered under one head—the Surgeon General—the veterinary and medical services are in a technical sense separate except as they may occasionally meet on the common ground of an animal disease which might possibly be communicable to man. Proper coordination of its activities as a branch can be assured only when there is but one representative of the medical department on the staff of the commanding

officer. Such duty logically devolves upon the senior medical officer present with the command. The veterinarian furnishes the surgeon with such technical information concerning veterinary matters as may be necessary for him to represent properly that phase of the medical department's activities to the commanding officer. The technical and professional activities of the veterinarian are not supervised by the surgeon.

In general the duties of a staff medical officer in connection with the veterinary service are as follows:

In the absence of a veterinary officer the surgeon is directly responsible for the veterinary service, including its administration.

In the absence of all veterinary personnel (officers and enlisted men) the surgeon represents the medical department in matters pertaining to the veterinary service, utilizing such facilities as may be at his disposal. He keeps the commanding officer advised as to the veterinary needs of the station or command.

Medical Attendance

The principal agencies maintained for providing or initiating medical attendance in the Army are:

At permanent stations—hospitals and dispensaries.

In the field—aid stations, collecting stations, clearing stations, hospitals and dispensaries.

For Whom Authorized. Medical attendance is authorized for the following personnel:

Military. Officers, warrant officers, cadets, Army nurses, enlisted men, and contract surgeons (full time) of the Army of the United States while in active federal service, general prisoners, and prisoners of war.

Persons of the classes enumerated above who are on the retired list of the Army and who report in person at any Army dispensary or hospital. Medical officers and contract surgeons are not required to leave their stations to attend those on the retired list.

Members of the National Guard not in federal service while in attendance at a federal training camp and under certain other conditions as prescribed in National Guard Regulations.

Members of the Officers' Reserve Corps and of the Enlisted Reserve Corps, when on an active duty status.

Civilian. Members of the Reserve Officers' Training Corps while attending a federal training camp.

Trainees at a Citizens' Military Training Camp. Persons in military custody or confinement and applicants for enlistment while under observation.

Whenever practicable the families (including wife, minor children, other dependents, and servants of the household) of military personnel enumerated above, when residing with and actually dependent upon such persons. Civilian employees of the Army (including civilian employees of post exchanges) at stations or in the field where other medical attendance can not be procured. Civilian employees of the United States Government who receive personal injuries in the performance of official duty who may report for treatment at an Army dispensary or hospital upon request of the officer under whom they are employed, provided other government hospitals for the treatment of such employees are not more convenient of access.

Civilian Medical Attendance. When medical attendance is required by an officer, warrant officer, Army nurse, enlisted man, or contract surgeon (full time) on duty with any command or detachment, or by a prisoner in military custody, or by an applicant for enlistment under observation, and cannot otherwise be had, the commanding officer may employ the necessary civilian service and just accounts therefor will be paid by the medical department.

Regularly licensed civilian physicians may be authorized by the commanding officer to practice medicine upon military reservations or camps under certain conditions. In general, regulations provide that civilian physicians so practicing must observe

the current rules relative to the protection of the command against communicable diseases, and the established ethics of the civil medical profession, and furnish data for preparation of sick and wounded records in the case of military personnel.

Civil Medical Practice. Professional private and civil practice in civilian communities, the needs of which are being satisfactorily met by civilian practitioners, will ordinarily be restricted to consultation practice with such civilian practitioner, and to emergency measures necessary to save life or to prevent great suffering. (Par. 8, AR 40-510.)

Releasing Information Regarding Condition of Patient. Medical officers may impart such information regarding the condition of a sick or wounded patient as may be necessary to allay the anxiety of relatives and friends. The furnishing to unauthorized persons of information which can be made the basis of a claim against the Government is prohibited.

Sick Call

The Daily Sick Report. When an officer, contract surgeon, warrant officer, cadet of the United States Military Academy, flying cadet, Army nurse or enlisted man is in need of medical attention his (or her) name and grade, with Army serial number, is placed, preliminary to his attendance at sick call, upon the daily sick report (W. D., A.G.O. Form No. 5) of the organization or detachment. The daily sick report consists of two parts:

The organization commander's report. This is prepared in the organization (company) and is signed by the commander thereof. If the organization commander can not state definitely whether the alleged sickness originated in the line of duty he places an interrogation mark (?) in the proper column pending investigation and decision. It is the duty of the organization commander to determine the line of duty status, particularly in the case of injury which is likely to result in partial or complete disability of the patient.

The medical officer's report. This is filled out and signed at the place of holding sick call. The line of duty entry is particularly important because an individual absent from duty for more than one day because of disease incurred not in line of duty and as the result of misconduct has pay deducted for the period of such absence, and time so lost cannot be counted as service. Under peace-time enlistment conditions, an individual may be held in the service after the normal date of completion of the enlistment for a period equal in time to such absence from duty. The medical officer indicates in the disposition column the status of the patient as "hospital," "quarters," or "duty." There is no such status as "light duty" or "part duty." The daily sick report is referred to by each company in rendering its morning report to headquarters. Information on the sick report should be complete in accordance with the column headings as some of the entries may affect the soldier's pay.

Conduct of Sick Call. Sick call is a military formation held daily at an hour designated by the commanding officer, except when the command is in combat. At this time all sick or injured should be conducted by a noncommissioned officer to the surgeon at the hospital, dispensary, or other place for holding sick call to determine whether they can continue their regular duties or whether they should be taken up on the surgeon's report of sick and wounded and admitted to hospital or quarters. This examination of the sick is in the nature of a "sorting" and should be conducted as expeditiously as possible and at a suitable hour so that the operations of the organization may not be delayed or interrupted. Those cases obviously needing "hospital" or "quarters" treatment are so marked on the daily sick report. Admission to hospital is accomplished after the "sick call" has been completed. Those able to do "duty" are so marked on the daily sick report and immediately sent back in charge of their noncommissioned officers to their organizations. Should any of the "quarters" or "duty" type require further examination or treatment, an appointment therefor should be arranged. In case of emergency, sick or injured may be admitted to the hospital at any hour. However, the proper notations should be made on the company sick report as soon as practicable.

Patients not admitted to hospital or quarters but who are treated are recorded on

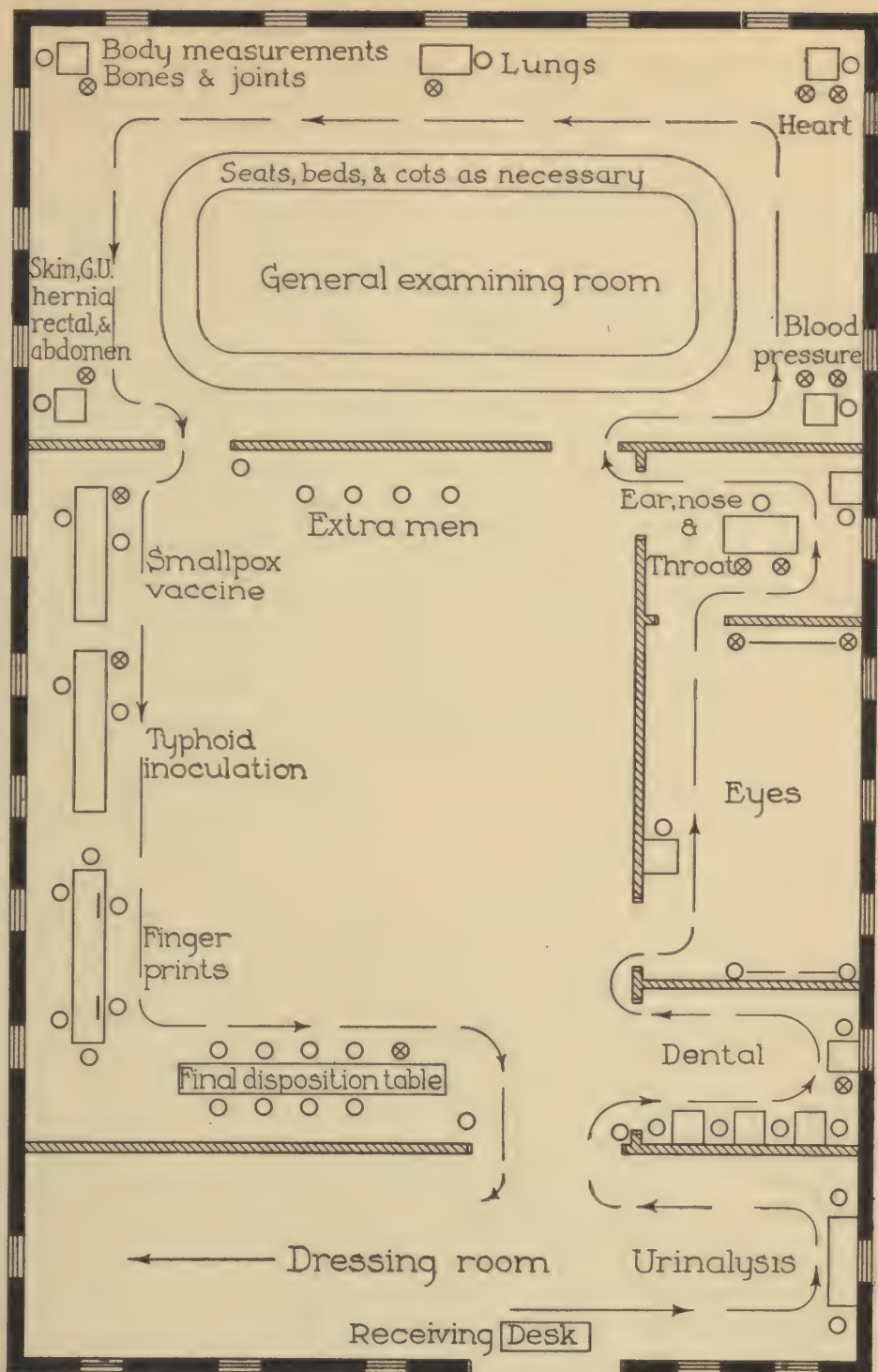


Plate 1. Diagram Showing Suitable Arrangement of
A Physical Examining Room.

an "out-patient" index card which shows in brief the diagnosis and treatment given. This index is useful in summarizing the number of out-patients treated and treatments given each month, the report of which is included on the monthly report of sick and wounded, W.D.M.D. Form No. 51.

Recruiting and Physical Examinations

Under the provisions of the Selective Service Act, the majority of individuals entering the army do so through the process of selection by local selection boards, and make their actual entry into the service through induction centers. For the duration of the war, enlistments in the Regular Army have been discontinued, but certain individuals with the approval of the selection board may be accepted for voluntary enlistment in the Army of the United States. For this purpose, when so authorized, at posts, camps, or stations a recruiting officer is designated to make enlistments. While such duties may be delegated to medical officers the latter are usually concerned only with the physical examination of the applicants. These examinations are made by medical officers or, in their absence, by civilian physicians hired for the purpose. The physical examination of candidates for commission is also a function of the Medical Department.

Physical Standards. Army Regulations prescribe standards of physical examination in order to insure efficiency and uniformity in the procurement of personnel that will be physically fit for the rigors of military service. In general the applicant must be able to see and hear well; his heart must be competent to stand the stress of physical exertion; he must have intelligence enough to understand and execute military maneuvers, obey commands, and protect himself; and he must be able to transport himself by marching. The physical standards prescribed for candidates for commission are in some respects higher than those prescribed for applicants for enlistment, but, in general, the same physical standards apply to both. The physical standards for flying differ and are more exacting; officers who conduct such examinations are specially trained and qualified for that work. Since the outbreak of hostilities the high standards specified for peace time have been modified in order to permit the enrollment of individuals suitable for special service or particular military duties. Classifications as to fitness for special types of service will depend upon the standards set at the time by the War Department.

Conduct of Physical Examinations. The physical examination of a few applicants presents no real difficulties. The examination of large numbers of men in time of mobilization, however, requires a high degree of organization. Any scheme of examination for military service involves the following steps: preparation of records; physical examination; preparation of identification records; and immunization against smallpox, typhoid, and paratyphoid. The ideal plan for the examination of large increments will include the bathing, disinfection, physical examination, and the issue of uniforms and equipment under one roof. The room or rooms for the physical examination should have ample space and should permit an arrangement of the several examining groups so that quiet may be maintained. An even temperature, so that men in the nude may be comfortable, is necessary. It is important that the clerks and examiners be so arranged in the logical sequence of the examination that there be no congestion of examinees at any one place; if not, confusion will result. Teamwork is essential; there should be a continuous flow of examinees, moving on the one-way traffic principle. Plate 1 shows a suitable arrangement of an examining room. Additional examining personnel may be added to the stations as needed.

Personnel for an Examining Team. A small examining team should have the following personnel: A general supervisor; an internist; a surgeon; an eye, ear, nose, and throat examiner; and a dentist. Each of these officers should have an intelligent enlisted assistant, capable of making entries on the physical examination form. In addition there should be a clerk to initiate the physical examination forms and another to complete them; also three noncommissioned officers or specialists to conduct the immunization and to take the fingerprint records. A noncommissioned officer and several orderlies are desirable to maintain order and to safeguard the clothing of disrobed applicants. A newly organized group outlined as above should be able to

examine 12 to 15 persons per hour. By continuous functioning as a team and with proper supervision the group may examine twice that number.

Larger teams will include specialists such as psychiatrists, orthopedists, and heart and chest examiners. The rate of examination per applicant examined does not increase in direct proportion to the size of the examining group. If many examiners and suitable space are available better results will be obtained in examining continuous large increments by utilizing several examining teams. Alternating teams in 4-hour shifts is a good method when space is limited.

Physical Examination Records. The principal records accomplished on the entry of an individual into the service either by enlistment or induction are shown below. Only those marked by an asterisk (*) are usually made by the medical examiner; the others pertain more particularly to the duties of the recruiting, the induction, or other officer. Those records made at the time of enlistment are:

Report of Enlistment. W.D., A.G.O. Form No. 13.

Enlistment Record, Army of the United States. W.D., A.G.O. Form No. 22 (This contains the form* for the physical examination).

*The F.B.I. Military Fingerprint Card.

Service Record. W.D., A.G.O. Form No. 24.

Individual Clothing and Equipment Record. W.D., A.G.O. Form No. 32.

*Immunization register. W.D., M.D. Form No. 81.

Those records opened or completed in the process of induction either by the local board, at the induction station, or at the reception center are:

Order to Report for Induction. D.S.S. Form No. 150. (initiated by the local board, but completed by the inducting officer).

Information for Armed Forces. D.S.S. Form No. 140 (initiated by the local board and accompanies the individual throughout his service).

Report of Induction. W.D., A.G.O. Form No. 221. (This contains the form* for the physical examination).

*F.B.I. Military Fingerprint Card.

Service Record.

Individual Clothing and Equipment Record. (This is opened at the reception center).

*Immunization register. (Immunizations are normally instituted at the reception center).

Immunization. Inasmuch as the immunization of an individual cannot be completed at the time of enlistment, arrangements must be made to complete it. Medical personnel and a suitable place (usually the hospital) must be provided. Arrangements must also be made with organization commanders to insure that all personnel on which immunization has begun will report on the proper date at the time and place designated. Cooperation between medical officers and organization commanders is an important factor in completing immunizations expeditiously. If large groups are being immunized, one medical officer with several assistants will be needed for the administration of the second and third doses of typhoid vaccine. One medical officer and an assistant are usually sufficient to determine the result of the smallpox vaccination and to revaccinate unsuccessful cases. Each soldier appearing should have with him his immunization register (Form 81 M.D.) on which the medical officer enters the date of administration and the result in case of smallpox vaccination. The same entries are made on the register retained in the hospital. Among newly mobilized units it is important that the surgeon take steps to insure that the record of completed immunization is entered on the soldier's service record. In the case of officers and warrant officers the original record of completed immunization is given to them for their personal files.

Report of Physical Examination. Forms for the physical examinations are standardized for officers and enlisted men, respectively. The officer's physical examination is recorded on W.D., A.G.O. Form No. 63 (Plate 2), except in the case of an officer of the Air Corps requiring a special physical examination conducted by an aviation medical examiner or flight surgeon, which is recorded on W.D., A.G.O. Form No. 64.

(See AR 40-100 and 40-105)

1.	(Last name)	(First name)	(Middle initial)	(Serial number)
2.	(Grade)	(Organization and arm or service)	Age _____ (Nearest birthday)	Years of service _____ (Whole number only)
3.	Nature of examination ¹		Component of Army ²	
4.	Typhoid vaccination, No. series completed _____		Last series _____, 19____	
5.	Date of last smallpox vaccination _____		Type of reaction _____	
6.	Other vaccination or immunity tests _____			
7.	Medical history ³ _____			

8. Eyes

Distant vision: Right	20/.....	correctible to 20/.....	by ^a
(Snellen type) Left	20/.....	correctible to 20/.....	by ^a
Near vision: Right	J#.....	correctible to J#.....	by ^a
(Jaeger type) Left	J#.....	correctible to J#.....	by ^a
Refraction ^b (under cycloplegic): Right	Left		
Color perception (red and green) ^c	.....	

9. Ears
Hearing (low conversational voice): Right /20. Left /20. Audiometer (percent loss): Right Left

10. Nose and throat

11. Teeth:⁷

Right					(Examinee's)					Left				
8	7	6	5	4	3	2	1	2	3	4	5	6	7	8
16	15	14	13	12	11	10	9	10	11	12	13	14	15	16

Remarks, including other defects

Indicate: Restorable carious teeth by ○; nonrestorable carious teeth by /; missing natural teeth by ×.

Classification	
Prosthetic dental appliances	

12. Posture	Figure	Frame
(Excellent, good, fair, bad)	(Slender, medium, stocky, obese)	(Light, medium, heavy)

13. Temperature Height inches. Weight pounds. Chest: Rest inches; inspiration inches;
expiration inches. Abdomen inches.

14. Cardiovascular system: Heart

Blood pressure: S. D.	Pulse: Rate—Sitting	Immediately after exercise
Two minutes after exercise	Character .....	.....
Arteries	Varicose veins .....	.....

15. Respiratory system

16. X-ray of chest ⁸

17. Skin and lymphatics Endocrine system

18. Bones, joints, and muscles

..... Feet

19. Abdominal viscera

20. Hernia Hemorrhoids

¹ Appointment, promotion, retirement, annual, active duty, special.

² Regular Army; National Guard; Officers' Reserve Corps; Reserve Officers' Training Corps.

3 If annual physical examination, record only for past year.

^d If annual physical examination, record only distant and near vision, and state whether defect is properly corrected.

- When indicated.
- Not required for

² If rejected for appointment in Regular Army

* Required for candidates for commission.

U. S. D., A. G. O. Form No. 63

- Corps.

(Name and grade)

(Place)

Corps.

(Name and grade)

(Date)

19.

(Name and grade)

Corps.

1st Ind.²

.....
(Name)

(Grade)

.....
(Organization and arm or service)

Commanding.

2d Ind.²

19..... To The Adjutant General.

¹ Required for candidates for commission.

² State action taken on recommendations of the board. If incapacitated for active service, state whether action by retiring board is recommended.

Phraseology used in completing these forms should indicate accurately the actual physical condition of the officer or officer-candidate.

Military Hospitals (TM 8-260)

Mobile Hospitals. In time of war *mobile* hospitals form a constituent part of the mobile forces. These hospitals are established in the combat zone and comprise evacuation hospitals, surgical hospitals, convalescent hospitals, and the clearing stations (emergency and in camp) operated by the clearing companies of medical regiments, medical battalions, or medical squadrons. These field medical installations are discussed in Chapters II, III, and IV.

Fixed Hospitals. The *fixed* or nonmobile military hospitals are identical in time of war or peace and serve the same general purposes. (See Plate 3.) They are established in the zone of the interior and the communications zone. Whenever practicable three or more



Plate 3. Brooke General Hospital, Fort Sam Houston, Texas.

general hospitals may be grouped at one place into an administrative and clinical organization known as a "hospital center." A convalescent camp constitutes a part of the hospital center. The administration of these fixed hospitals is similar to that of the fixed hospitals of peace time. In time of peace or war at home or abroad, only two types of fixed hospitals are maintained. These are station hospitals (at times called post or camp hospitals), and general hospitals.

Station Hospitals. These are provided for the hospitalization of sick and wounded of local commands of the station to which it pertains, and will ordinarily have facilities to hospitalize approximately 5 per cent of the local command. In peacetime and in the zone of the interior in wartime they are identified by the type, title of the hospital, and its location, for example, Station Hospital, Fort Benning, Georgia. They function under local commanders, *e.g.*, the station hospital at Fort Benning is conducted by the surgeon at Fort Benning who functions under the commanding officer, Fort Benning. Station hospitals in a wartime theatre of operations are designated and iden-

tified by their number, type, and title, for example, 7th Station Hospital. Their location is not given.

General Hospitals. These consist of two types, the numbered and the named. The numbered general hospitals are designed for employment in theatres of operation, and are designated by number and type (*e.g.*, 112th General Hospital). The method of their employment is discussed in Chapter V. The named general hospitals are established in the zone of the interior and are designated by type, title, and location (*e.g.*, O'Reilly General Hospital, Springfield, Missouri). The names of these general hospitals are usually those of deceased medical officers of the Army of the United States whose services were of a distinguished character. Exceptions to this rule are the recently established Valley Forge General Hospital in the vicinity of Valley Forge, and the Woodrow Wilson General Hospital at Staunton, Virginia. In the zone of the interior, general hospitals are established to afford better facilities than can be provided in station hospitals for the care and disposition of those cases requiring prolonged or special treatment. The organization of a general hospital is shown in Plate 4. In wartime they operate under the administrative control of the Service Command in which located except for certain features directed by the Surgeon General. During the period of the emergency and since the outbreak of hostilities, the number of named general hospitals has been considerably increased. Those which were in operation prior to the current expansion are:

Army and Navy General Hospital, Hot Springs, Arkansas.

Fitzsimons General Hospital, Denver, Colorado.

Letterman General Hospital, San Francisco, California.

Sternberg General Hospital, Manila, Philippine Islands.

Tripler General Hospital, Honolulu, Hawaiian Islands.

Walter Reed General Hospital, Washington, District of Columbia.

William Beaumont General Hospital, El Paso, Texas.

Veterinary Hospitals. Hospitals of both the fixed and mobile types are provided by the veterinary service for the care of animals and are indicated by adding to the usual basic title the word "veterinary," *i.e.*, "veterinary general hospital" and "veterinary station hospital."

Army Dispensaries. To provide medical attention for groups of military personnel not located at army stations, or where there is an excessive amount of out-patient clinic service, general dispensaries staffed with Medical Department officers and enlisted men are established at these centers of military activity.

Administration of Fixed Hospitals

Hospital Services. For convenience of administration and in the interest of professional efficiency, the commanding officer of each Army hospital organizes the professional and other activities of his hospital into services and prescribes the number and the line of control over them and their relationship to each other. The following represent the services customarily established in large hospitals, though considerable variation therefrom is allowed to the discretion of the commanding officer of the hospital concerned: administrative; dental, eye, ear, nose, and throat; laboratory; medical; neuropsychiatric; nursing; orthopedic; physical reconstruction; roentgenological; surgical; urological.

The administrative service of a fixed hospital includes such personnel and activities as the commanding officer of the hospital may prescribe. The personnel and activities that follow properly belong in the administrative service:

Personnel. Commanding officer, executive officer, adjutant, personnel officer, detachment commander, registrar, mess officer, supply officer, chaplain, and chief nurse.

Activities. Admission and discharge of patients, hospital inspection, hospital mess, fire control, summary court, recruiting, post exchange, detachment, Medical Department, etc.

Titles of Duty Personnel. The personnel performing the more important administrative and clinical duties at a hospital are designated as follows:

Duty	Title
Commanding hospital (the surgeon)	Commanding officer.
In charge of a service	Chief of ——— service.
Commissioned assistant on a service	Assistant ——— service.
Officer in charge of records of sick and wounded	Registrar.
Officer in charge of a ward	Ward officer.
Commissioned assistant in a ward	Assistant ward officer.
Nurse in charge of a ward	Head nurse.
Principal enlisted assistant in a ward	Ward master.
Other enlisted assistant in a ward	Ward attendant.

Medical Officer of the Day. A medical officer of the day is detailed by roster daily to serve as such for 24 hours. His functions are both administrative and professional, although in large hospitals the duties may be apportioned among several individuals. During his period of duty he holds himself available for emergency professional service, particularly during hours when other medical officers are off duty. He is in charge of the hospital at night, makes inspections at stated intervals, inspects the mess at each meal, and represents the commanding officer of the hospital in the latter's absence. In large hospitals, both a medical officer of the day and an administrative officer of the day may be designated. If this is done the duties of the medical officer of the day are limited largely to strictly professional activities connected with the care and disposition of patients.

Hospital Commanders

Duties of Commanding Officer of Hospital. The commanding officer of a hospital is responsible for its proper discipline and administration, including the care and preparation of reports, registers, and records as well as for the care and safeguarding of all public property which may come into his possession; for the proper expenditure of supplies and funds; and for the preparation of requisitions, returns, and pay rolls of the hospital. While the commanding officer is charged with the execution of duties properly delegated by him to an assistant, yet he is responsible for exercising such supervision over duties thus delegated as to insure their prompt and efficient performance by the designated subordinate.

Relations to Patients. The commanding officer (or one of his commissioned assistants) determines what patients are to be admitted to or discharged from the hospital. Admission and assignment of patients to wards are usually accomplished by the medical officer of the day. The commanding officer is responsible for supervising the care and treatment of all patients. He, or a commissioned assistant designated by him, commands the detachment of patients. Within the continental limits of the United States when the condition of a patient has reached a stage which seriously endangers life, the commanding officer communicates the fact (by telegraph or otherwise) to the person designated by the patient to be notified in case of an emergency. Outside the continental limits of the United States such information is forwarded to the Adjutant General who, in turn, notifies the emergency addressee. The commanding officer will also notify the Army chaplain on duty at the station where the hospital is located.

Relations to Duty Personnel. The commanding officer (or one of his commissioned assistants) commands the duty personnel as a detachment commander. He assigns the personnel to appropriate duties and prescribes and enforces regulations as to the sanitary, disciplinary, and other requirements of the hospital.

Inspections by Hospital Commander. Depending on its size, the commanding officer inspects or directs the inspection of the entire hospital daily, and on Saturdays he inspects or causes to be inspected the detachment, Medical Department.

The Registrar

Duties of Registrar. The office of registrar is peculiar to the Medical Department. The registrar has charge of all medical and surgical records, and sees that careful and

accurate clinical histories, statistical tables, etc., are kept. He prepares all reports and returns pertaining to the sick and wounded. He customarily is the commanding officer of the detachment of patients and unit personnel officer. In this capacity he has charge of the service records, accounts, and returns of patients. He is also custodian of their money and valuables.

Report of Sick and Wounded. When a patient is admitted to, or marked "Quarters" by a hospital that is not part of a field force, his name is entered on a Register Card (MD Form 52) (see plate 7). This card provides a summary of the case, entries being made as data is obtained from the patient's clinical record (MD Form 55) maintained by his ward officer. While the patient is in hospital or quarters the card is filed alphabetically according to patient's last name with the cards of other active cases, thus constituting the *current register* and providing a ready index to such cases. Upon completion of the case (return to duty, transferred, died, etc.) the Register Card is filed according to its register serial number with other completed cases, comprising the *permanent register* and providing a permanent record of the sick and wounded of the military establishment.

The Register Card must be complete and accurate in all respects. The patient's name, serial number, etc., must be correct so as to establish his identity without question. Diagnoses and operations should follow the detailed nomenclature prescribed in Army Regulations (similar to those shown in publications of the Bureau of Census). The "line of duty" status must be noted correctly inasmuch as reference may be made to this record in case of a claim for pension.

In order to complete the soldier's record in the War Department, an exact copy of the Register Card is made on the same MD Form 52 and is called the Report Card. Together with the Report Sheet (MD Form 51) (see plates 5 and 6), the Report Cards of all cases completed during the month are forwarded each month through the next higher surgeon to the Surgeon General. The Report for December also includes temporary report cards known as "Remaining Cards," which account for incompleting cases remaining in hospital or quarters on December 31st.

Of the reports a hospital is required to render, this monthly Report of Sick and Wounded is one of the most important, providing as it does an invaluable source of information.

Units other than hospitals, such as the regimental medical detachment, when located in garrison on a post, camp, or station in the Zone of Interior, render a monthly Report of Sick and Wounded for patients under their control in the same manner as hospitals. However, when moving between stations, in the field on maneuvers, or in the Theatre of Operations, these units use the Emergency Medical Tag (MD Form 52b) in lieu of the MD Form 52 (see Emergency Medical Tag, Chapter I).

Hospitals that are part of a field force also render a monthly Report of Sick and Wounded, but use the Field Medical Record (MD Form 52c & d) in lieu of the MD Form 52 (see Field Medical Record, Chapter III).

Statistical Report (MD Form 86ab and 86c). (See Plates 8a, b, c, and 9a). For instructions as to use of the statistical report see Plates 8c, and 9b.

Statistical Report (Form 86 a, b, and c, M. D.). (See Plates 9 and 10.) For instructions as to the use of the statistical report see Plates 8c, and 9b.

Ward Management

Ward Officer. The professional service in the wards of military hospitals is similar to that in civil hospitals. Ward officers, however, have functions other than the strictly professional ones. A ward officer is responsible for the professional care and welfare of the patients of his ward, the preparation of all clinical records and reports, the discipline and the work performed by the duty personnel, and all property pertaining to the ward.

Responsibilities of Ward Assistants. The head nurse, or the ward master in wards to which Army nurses are not assigned, is directly responsible to the ward officer and, under him, has general supervision of the ward, the enlisted assistants, and patients,

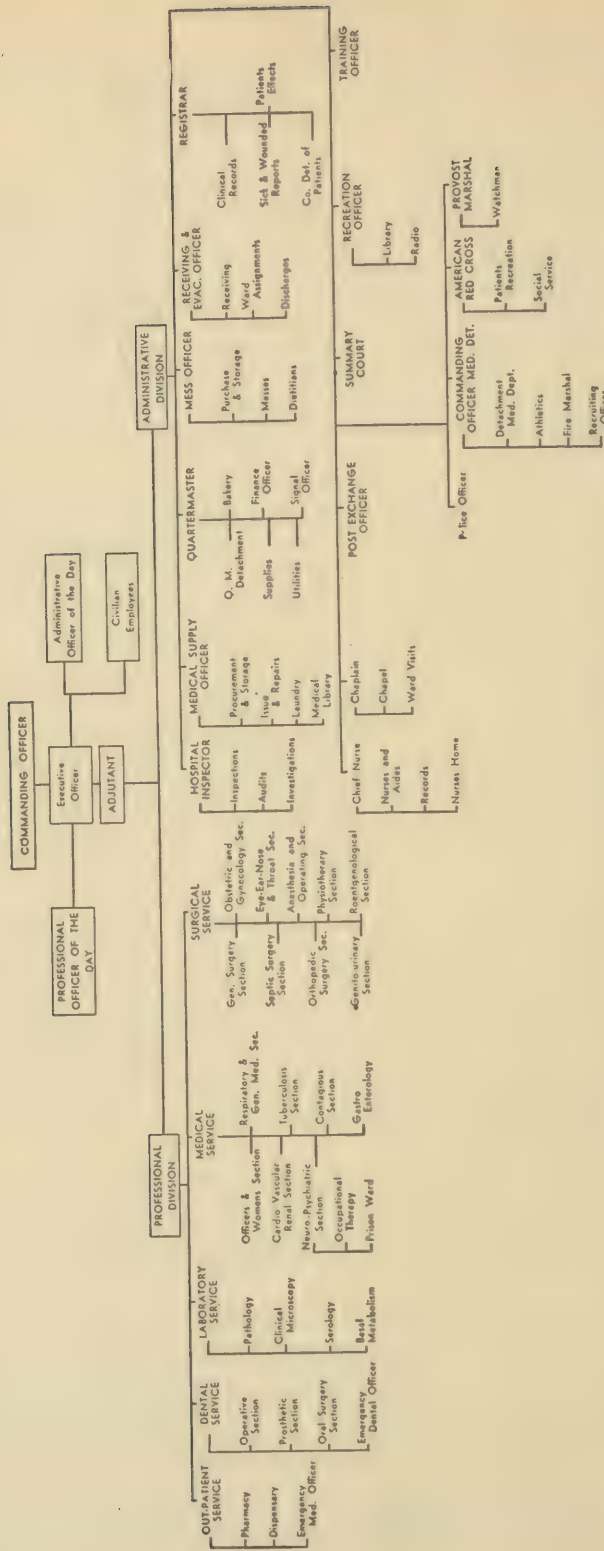


Plate 4. Organization of a General Hospital, Zone of the Interior.

Form 51
MEDICAL DEPARTMENT, U. S. ARMY
(Revised Nov. 26, 1940)

REPORT SHEET

1. REPORT OF SICK AND WOUNDED AT—

Station Hospital, Fort School, Pa.

(Here state the name or number of the hospital, or organization, with location on the last day covered by the report, except in the theater of operations in time of war, when the numerical designation only will be given.)

2. PERIOD

Month of August 1942
(Give beginning and end of period, if less than a month.)

3. COMMAND

(Here specify the command and the regiments, companies, and detachments composing it on the last day covered by the report, together with either the tactical division, Army corps, or field Army, or the territorial corps area or department, of which it forms a part.)

THIRD SERVICE COMMAND

1399th Service Unit consisting of:

Medical Section,
Quartermaster Section,
Signal Section,
Ordnance Section,
DEML Section.

4. VARIATIONS IN COMMAND

(State important variations from the general composition of the command, as the arrival or departure of companies, giving the dates thereof respectively, and the names of accompanying medical officers. Reports relating to commands in the field should show the location of the principal camps occupied during the month, with the dates of arrival at and departure from each. When a hospital is opened or closed, or a Medical Department organization discontinued, during the period of the report, the fact and date thereof should be recorded and the orders directing it be cited.)

August 15, 1942:- 150 enlisted men arrived from Camp Lee, Va, unaccompanied by any medical officer.

5. MEAN STRENGTH OF COMMAND FOR THE MONTH

(a) REGULAR ARMY				(b) TRAINING UNITS			
Officers	76	White enlisted	625	N. G. Com. ⁴		E. R. C. ⁷	
W. O. ¹	2	Colored enlisted		N. G. Enl. ⁴		C. M. T. C. ⁸	
F. C. ²		Filipino enlisted		R. O. T. C. ³			
A. N. C. ³	8	Puerto Rican enlisted		O. R. C. ⁶			
		Total	711			Total	-

(c) Civilians not included in (b): Men 148 Women 165 Children 86 Total 399

(For method of computing the mean strength, see Instructions 5, reverse side of sheet. ¹ Warrant officers. ² Army field clerks and field clerks, Q. M. C. ³ Army Nurse Corps. ⁴ National Guard. ⁵ Reserve Officers' Training Corps. ⁶ Officers' Reserve Corps. ⁷ Enlisted Reserve Corps. ⁸ Citizens' Military Training Camp.)

6. PATIENT DAYS

	Hospital	Quarters		Hospital	Quarters
Regular Army, active list	3429	115	R. O. T. C.		
National Guard			C. M. T. C.		
Reserve Corps			All others Dependents	58	
			Total	3487	115

16-11000

7. PROFESSIONAL WORK (NOT OTHERWISE REPORTED)

	Number of patients	Number of treatments
(a) Out-patients: (1) Regular Army (5a).....	315	1157
(2) Training units (5b).....		
(3) Civilians (5c).....	71	243
Total.....	386	1400

(b) Physical examinations conducted (specify; see instruction par. 67g, AR 40-1025):

Appointment of officers in Regular Army 8
 Appointment of warrant officers in AUS 17
 Enlistment in Army of the United States 15
 EM for appointment to Officer Candidate School ... 39
 Enlisted men for foodhandlers 24
 Civilians for appointment in Civil Service 19

(c) Vaccination and immunization, and sensitization tests administered (specify):

Typhoid 54
 Smallpox 72
 Tetanus Toxoid 18
 Dick Test 6

8. GENERAL REMARKS

Organizations present on post but accounted for on their own Report of Sick and Wounded:
 1st Infantry,
 10th Cavalry,
 20th Field Artillery Battalion.

9. CERTIFICATE

I certify that this sheet and the accompanying cards are a true and correct exhibit of the sick and wounded of the command specified above for the period indicated. Cards of 357 completed cases accompany this sheet; with the December report, cards for remaining cases. (See par. 64 (4) a AR 40-1025.)

JOHN J. DOE, Colonel, Med Corps, U. S. Army,
Surgeon.

INSTRUCTIONS

- (c) The report of sick and wounded comprises the report sheet, Form 51; report cards, Form 62; emergency medical tags, Form 63b; field medical cards, Form 63c; and field medical record jackets, Form 62d. (See Section VI, AR 40-1025.)
- Entries on the report sheet and report cards should be made with typewriter when possible. When a typewriter is not available, the entries should be made in the field, when pencil is permissible. When a typewriter is used, the name of the officer signing this form and signing or initialing the report cards should be typed immediately below his signature or initials.
- See instructions in space 2 or par. 67b, AR 40-1025.
- See instructions in space 3 or par. 67c, AR 40-1025.
- See instructions in space 4 or par. 67d, AR 40-1025.
- The mean strength will be computed as follows: The totals of strength for each day of the period will be added together by heads or items (officers, white enlisted men, colored enlisted men, civilians, etc., separately) and divided by the number of days in the month for which the report is made. The quotients are the mean strength by items. In cases in which the totals of strength are divided by the number of days in the month, the totals will nevertheless be divided by the number of days in the month. See also par. 67e, AR 40-1025.
- See par. 67f, AR 40-1025.
- See par. 67g, AR 40-1025.
- See par. 67h, AR 40-1025. Under GENERAL REMARKS record any facts of importance not otherwise provided for.
- See par. 67i, AR 40-1025.

and is obeyed and respected accordingly. The head nurse (or the ward master) is responsible for the following: the administration of medicine and other treatment prescribed, the keeping of records, the cleanliness and order of the ward, the public property therein, the delivery of prescriptions to the pharmacy and of medicines to the ward, the delivery of diet cards to the mess officer, and the effects of the patients until they have been turned over to the proper custodian.

Ward Rules. The following are some of the ward rules in effect in Army hospitals:

No enlisted man except those authorized in writing by the responsible medical officer will administer medicine to a patient in hospital, and then only as directed under such limitations as his written authorization shall prescribe.

Active poisons, alcohol, and alcoholic liquors when necessarily on hand in the ward will be kept under lock and key.

Disinfectants and medicines for external use only will not be kept with medicines for internal administration.

Patients upon reaching the ward will be bathed, clothed in clean hospital clothing, and put to bed unless their condition indicates otherwise or a specific order forbids.

On the death of a patient the ward master will notify the ward officer or, in his absence, the medical officer of the day. He will not remove the body from the ward until after it has been examined by the medical officer.

All property of the ward will be checked by the ward officer or his assistant at frequent intervals, and all overages or shortages found will be adjusted.

Ward Morning Report. A morning report of the ward (Form 72 M. D.) is forwarded by the ward officer to the registrar each morning immediately after the morning rounds have been made. This report is accompanied by diagnosis slips for new admissions, by change of diagnosis cards, by the clinical records of all cases completed in the ward or which depart from the ward otherwise than by transfer to another ward, and by the notices of cases transferred to other wards since the preceding report.

It is important that the ward officer send in diagnosis slips promptly for all patients in order that the commanding officer and chief of service may be informed of the general type of cases being admitted to the hospital.

Diet Cards. Diet cards (Form 73 M. D.) covering the diet requirements for the ensuing 24 hours are sent by the ward officer to the mess officer each morning.

Clinical Record. A clinical record (Form 55 M. D.) is kept for every patient admitted to the hospital. (See Plate 10.) Upon departure of the patient from the hospital all the sheets of the clinical record are arranged in their proper order, signed by the ward surgeon, and sent to the registrar's office with the next morning's report of the ward. Should a patient be transferred from one ward of the hospital to another his clinical record is sent with him to the new ward and the fact of the transfer is noted.

Patient's Effects and Pay

Patient's Property. The clothing and other effects of every patient admitted to hospital are tagged (Form 76 M. D.) for identification and listed in duplicate on the patient's property card (Form 75 M. D.) in the presence of the patient. The list together with the effects is sent to a designated storeroom. Money and valuables belonging to patients are deposited in the hospital safe or in a bank by the commanding officer or officer designated by him, and the patient is given a proper receipt. Enlisted men on duty are forbidden to retain money or other valuables received from patients for safe-keeping or to have financial dealings with them. The soiled clothing of patients is washed as a part of the hospital laundry. Infected clothing is disinfected at Government expense. Government property brought to the hospital by the patients is also listed and accounted for and is kept intact whenever circumstances warrant.

Pay of Patients. Patients at a station hospital are usually paid on their organization pay rolls, the money being collected by their company commanders and delivered to them. The commanding officer of a general hospital is also commanding officer of the patients therein and makes provision for their pay.

Service Record of Patient Detached from His Organization. Whenever an enlisted

man is *detached from his organization* for admission or transfer to a hospital, the soldier's service record is sent to the commanding officer of the hospital or station immediately following such admission or transfer. Service records of patients are not sent to the hospital so long as the organization to which they belong is stationed in the vicinity of the hospital.

1. PRESTYER NO. 5678			
2. LAST NAME Brown,		3. FIRST NAME AND MIDDLE INITIAL Adam P.	
		4. A. S. NO. 45,678,910	
5. GRADE Cpl	6. COMPANY C	7. REGIMENT AND ARM OR SERVICE 1st Infantry	
		8. AGE 22	
9. RACE W	10. NATIVITY NY	11. SERVICE 5/12	12. DATE OF ADMISSION August 12, 1942
13. SOURCE OF ADMISSION Informal transfer from Disp, 1st Infantry, Fort School, Pa.			
14. CAUSE OF ADMISSION			

Fracture, simple, complete, transverse, one inch from distal end, right radius; accidentally incurred when patient slipped and fell on outstretched right arm while running the obstacle course at Fort School, Pa, August 12, 1942.

15. LINE OF DUTY	Yes
16. INJURY CODE	NOT REQUIRED
17. ADDITIONAL DIAGNOSES, OPERATIONS	
August 12, 1942:- Fracture, closed treatment of, with plaster of Paris.	

18. PLACE OF TREATMENT	Hospital
19. DISPOSITION	Duty
20. DATE OF DISPOSITION	September 28, 1942
21. NAME OF HOSPITAL	Station Hospital, Fort School, Pa.
22. SENT WITH REPORT OF S. & W. FOR MONTH OF	September 1942
23.	

JOHN J. DOE,
Colonel, Medical Corps, U. S. Army.
Form 52
MEDICAL DEPARTMENT, U. S. A.
(Revised March 15, 1938)

24. DAYS OF TREATMENT IN CURRENT CASE		
YEAR 19. 42	IN QUARTERS	IN HOSPITAL
January.....		
February.....		
March.....		
April.....		
May.....		
June.....		
July.....		
August.....		20
September.....		27
October.....		
November.....		
December.....		
TOTAL.....		47
Aggregate patient days		47

16-10301

Front Side
Plate 7. Sick and Wounded Report Card or Register Card.

Disposition of Patients

Patients are disposed of as follows: discharged to duty; discharged to quarters to be returned to duty later; discharged from the military service on certificates of disability; transferred to other hospitals; discharged from the Army for other cause (*e.g.*, in peacetime, expiration of enlistment); by death; by desertion.

Return to Duty. Patients previously designated by the ward surgeon (or chief of service) as fit for duty are marked "duty" on the company sick books at the time of

sick call and are returned to duty, usually immediately after breakfast. This day counts as a day of duty, and the organization takes credit for that day's ration. The hospital receives a ration for the day that patient was admitted.

Discharge for Disability. Enlisted men in the military establishment permanently unfitted for duty because of physical disability are discharged. They are retained and given treatment, however, until they have received the maximum benefit from it.

When an enlisted man in the hospital is considered a fit subject for such discharge, the surgeon notifies the soldier's immediate commanding officer. A certificate of disability is then initiated by the organization commander and forwarded to the commanding officer of the station. The latter refers the case to a board of medical officers. The board examines the man and reports the cause, nature, and extent of disability, and whether or not it was incurred in line of duty, for military purposes and in connection with compensation under war risk insurance act. In event discharge is recommended by the board, the board findings are forwarded to higher authority for review and approval. Approval of the findings may be made by any general officer commanding an *administrative* unit (e.g., the Service Command commander, and the Commanding Officer of an Infantry Division which is both an *administrative* and *tactical* unit), or by the commanding officer of a named general hospital. After approval of the board findings, the approving authority orders discharge of the individual and he is transferred to the Service Command exercising jurisdiction where the discharge is accomplished. The surgeon is notified of the fact of discharge so that hospital records may be completed. The diagnosis or degree of disability is not quoted on the soldier's discharge papers, simply the fact. The certificate of disability is *not given to the soldier* but is forwarded to the adjutant general with a report of action.

Enlisted men may also be discharged on recommendations of boards of officers because of inaptness, or undesirable habits or traits of character under Section VIII, AR 615-360. When the findings of such a board indicate that disqualification may be due to physical disability, the case is referred to a board of medical officers for action. If the latter finds that physical disability exists and is due to mental irresponsibility, the discharging authority usually directs discharge on certificate of disability. If the medical board finds no physical disqualification or if they find it to exist as the result of misconduct, discharge may be directed under "Section VIII, AR 615-360."

Care and Disposition of the Insane. Cases of insanity occurring in the military service are disposed of by discharge on *certificate of disability* following observation, examination, and recommendation for discharge by a board consisting of at least two medical officers, one of whom will be, if practicable, a specialist in nervous and mental diseases. Psychiatric cases among officers, army nurses, warrant officers, and enlisted men with over 20 years of service are transferred to general hospitals for disposition; others are disposed of locally by delivery to relatives, friends, or civil authorities following approval of the recommendation for discharge. Certain cases among nurses and enlisted men may be transferred to the Darnall General Hospital, Danville, Ky., after approval of such requests by the Surgeon General. Those cases entitled to compensation, care, and treatment under the war risk insurance act are discharged and cared for under the direction of the Veterans' Administration.

Disposition of compensable cases. Those requiring institutional care are sent to a hospital or to relatives or friends as determined by the Veterans' Administration. Those not requiring institutional care are discharged and the Veterans' Administration notified.

Disposition of non-compensable cases. Those requiring institutional care may be (1) Discharged and placed in care of relatives or friends; (2) transferred to St. Elizabeth's if admission is authorized; or (3) discharged and turned over to civil authorities legally required to assume care.

Those not requiring institutional care are discharged and liberated; relatives, friends, or civil authorities are then notified.

Authority to discharge from the service.

(a) *Compensable.* Service Command Commander.

(b) *Non-compensable.* Those not entitled to care and treatment at United States

expense are discharged by the Service Command commander, and placed in the custody of relatives, friends, or civil authorities. Those entitled to care and treatment, if not released to the care of friends, relatives, or state authorities, are examined by an Army Commitment Board (A.R. 600-505) and final disposition is made by the Adjutant General.

Form 96 ab
MEDICAL DEPARTMENT, U. S. ARMY
(Revised August 22, 1940)

STATISTICAL REPORT

First Section

*(A) Unit Station Hospital, Fort School, Pa. (a) (1) *(B) for day-week ending with morning report of Aug 14/42 (2)
(C) Mean strength of command during period covered by this report: (3)

	Officers	Enlisted Men	Warrant Officers	Nurses	Civilians
Regular Army	367	8121	18	45	Civ Employees ECC - 78
National Guard					Dependents - 204
Reserve					
*TOTAL (3)	367	8121	18	45	Total 282

PATIENTS—Peace, Regular Army only; War, all Military Personnel

DATE OF LAST REPORT, Aug 7, 1942	HOSPITAL (4)			QUARTERS (5)			TOTAL			AGGREGATE
	Disease	Injury	Battle Casualty	Disease	Injury	Battle Casualty	Disease	Injury	Battle Casualty	
(D) Remaining from last report	138	46		-	3		138	49		187
ADMISSIONS *(E) From command	54	12(b)			2		54	14		68
*(F) By transfer	2						2			2
By change of status										
(G) Total treated	194	58		5			194	63		257
DISCHARGES (H) Duty	25	10		2			25	12		37
(I) Transferred		3						3		3
(J) Died				1				1		1
(K) Otherwise				1(c)				1		1
*(L) Remaining (6)	169	45		1			169	46		215
(M) Patients fit for evacuation to other hospitals should the necessity arise	215			(N) Killed in action since last report (not to be included on line (J))			-			-

TOTAL BEDS OCCUPIED ON LAST DAY OF THE PERIOD					TOTAL DAYS OF TREATMENT DURING THE PERIOD			
	Officers	Enlisted Men	Nurses	Total		Hospital	Quarters	Total
Regular Army	5	208		213	Disease	1011	-	1011
Navy					Injury	269	15	284
Marine Corps					TOTAL	1280	15	1295
Reserve					*(Z) Causes of the deaths entered on line (J) (7)			
National Guard					1 death due to automobile accident			
Retired					(compound fracture of skull).			
Civilian employees†								
Other civilians, male								
Civilians, female (d)				2				
*(Q) TOTAL BEDS OCCUPIED (12)				215				
†Specify.								
(P) BED STATUS								
Classification	Permanent Buildings	Temporary Buildings	Total	(Pd) (11) Vacant				
Normal	75	425	*(Pa) (8) 500	285				
Emergency: a			*(Pb) (9)					
b								
Expansion			*(Pc) (10)					
TOTAL	75	425	500	285				

a. at 100 sq. ft.

b. at 72 sq. ft.

(V) REMARKS: (1) (a) Provides hospitalization for 1399th Service Unit, 1st Infantry, 10th Cavalry, and 20th Field Artillery Battalion.
(b) 1 injury hospitalized in Municipal Hospital, Harrisburg, Pa. since August 10, 1942.
(c) Carded for record only.
(d) Dependents of officers.

Mental cases admitted during week: None

Mental cases remaining: 5

See Instructions at Back of Pad

16-17220

Transfers to Other Hospitals. Patients may be transferred from one hospital to another for observation or to obtain better treatment or hospital accommodations. Transfers are accomplished from the larger station hospitals to named general hospitals in accordance with a system of bed credits established by the Surgeon General. The commanding officers of posts having bed credits allotted to their station hospitals may transfer patients without reference to higher authority provided they do not exceed their allotment of

COMMUNICABLE DISEASES

Second Section

DIAGNOSES	REMAINING FROM LAST REPORT Aug 7/42 (Date)	DISEASES ADDED SINCE LAST REPORT		DISPOSED OF SINCE LAST REPORT (3)	(U) REMAINING UNDER TREATMENT (4)
		(S) From Command and by Change of Disease Classification (1)	(T) By Transfer if Diagnosis on Transfer Card is Concurred in (2)		
DISEASES TRANSMITTED BY DISCHARGES OF THE RESPIRATORY TRACT	*Cerebrospinal fever (meningo- cocci)				
	*Common respiratory diseases (6)	18	4	-	13
	*Diphtheria				
	*Influenza				
	*Measles	-	2	-	2
	Measles, German				
	*Mumps				
	*Plague, pneumonic				
	*Pneumonia, primary (6)				
	*Pneumonia, secondary (7)				
	*Polymyositis, acute				
	*Scarlet fever				
	Tuberculosis, all forms				
	Vincent's angina	3	1	-	2
INTESTINAL DISEASES	Whooping cough			2	2
	*Cholera, Asiatic				
	*Common diarrheas (8)				
	*Dysentery, bacillary				
	*Dysentery, protozoal				
	*Dysentery, unclassified				
INSECT-BORNE DISEASES	*Typhoid fever				
	*Paratyphoid fever, types A and B				
	*Dengue				
	*Malaria				
	*Plague, bubonic				
	Relapsing fever				
VENEREAL DISEASES	*Typhus fever				
	*Yellow fever				
	*Chancroid	3	1	-	2
	*Gonorrhea	9	1	-	6
	*Syphilis	2	1	-	2
	Lymphogranuloma inguinale				
MISCELLANEOUS DISEASES	Granuloma inguinale				
	Chickenpox				
	Scabies	4	-	-	4
	*Smallpox				
	*Tetanus				
	Fever, still undiagnosed (9)				
	Special—Not listed (10)				
	Acute Rheumatic Fever	1	-	-	1

Venereal cases from column (S):

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	"Old"	"New"	"Long"
Chancroid		1	
Gonorrhea		1	
Syphilis			1
Lymphogranuloma			
Granuloma			

Signature _____

Name, typed JOHN J. DOE

Grade Colonel, Medical Corps, Surgeon

beds. Smaller station hospitals not having bed credits may transfer patients by authority of the Service Command commander. When a patient is transferred, the surgeon will send with him the original clinical record and a completed *transfer slip*, Form No. 52e M.D. In the theatre of operations patients transferred from one hospital to another are accompanied by their field medical records. (See Chapter III.)

Deaths. Whenever a death occurs in a military hospital the hospital commander reports the facts to the station commander in writing, also to the deceased's immediate

GENERAL INSTRUCTIONS

(a) *Plan and Purpose of the Report.*—The Statistical Report comprises three sections, in each of which is incorporated specific information required by the various divisions of The Surgeon General's Office and the office of the chief surgeon in a theater of operations. The sections are designed to furnish the following information: First section (Form 88ab), data concerning sick, injured, and battle casualties, hospitalization, and other statistical data; second section (Form 88ab), movement of communicable diseases; and third section (Form 88c), status of Medical Department personnel, other personnel attached to the Medical Department for duty, and transportation and material available for utilization by the Medical Department. (Par. 2a and 2b, AR 40-1080.)

(b) *By Whom Rendered.*—All Medical Department units will render this report. In time of peace separate reports will be submitted during the summer training period for each character of trainees, as National Guard, Reserve Corps, Reserve Officers' Training Corps, and Citizens' Military Training Camp. (Par. 2c and 2f (2), AR 40-1080.)

(c) *Time Interval for Rendition.*—Unless otherwise directed by competent authority, the first and second sections of the report normally will be rendered weekly to include data appearing on the morning report for Saturday. Under exceptional circumstances any section of the report may be required daily. (Par. 2d, AR 40-1080.)

(d) *Channels Through Which Rendered.*—In time of peace, and in the zone of the interior in time of war, the statistical report will be rendered in triplicate; one carbon copy forwarded direct to The Surgeon General, U. S. Army, Washington, D. C.; the original copy to the corps area or department surgeon; and the second carbon copy retained; except that detachments, regiments, and other organizations forming part of a division, camp, or subordinate administrative district which renders a consolidated report will render the report in duplicate only, forwarding the original to the next higher authority, who will consolidate the reports of units under his jurisdiction in triplicate and forward as directed above. (Par. 2e (1), AR 40-1080.)

In a theater of operations in time of war the reports, unless otherwise directed by competent authority, will be made in triplicate, one carbon copy forwarded direct to the chief surgeon of the forces, the original through medical channels to the next intermediate administrative office as may exist, and the second carbon copy retained; except that detachments, regiments, and other organizations forming part of a division, camp, or subordinate administrative district which renders a consolidated report will render the report in duplicate only, forwarding the original to the next higher authority, who will consolidate the reports of units under his jurisdiction in triplicate and forward as directed above for a theater of operations. (Par. 2e (2), AR 40-1080.)

(e) *Explanation of Special Symbols.*—The purpose of the capitals in parentheses (A), (B), etc., and the asterisks (*) are explained in paragraph (f). The Arabic numerals in parentheses (1), (2), etc., refer to the paragraphs in special instructions.

(f) *Telegraphic Reports.*—Telegraphic reports will be rendered only when specifically required or in emergency. Such reports will be forwarded in code and will comprise the data on all items on the report marked with an asterisk (*). Capitals (A), (B), etc., immediately preceding the headings, will be used as code letters to designate the headings. In addition to the telegram, all sections of the completed report will be forwarded by mail as provided for in paragraph (d). (Par. 2f, AR 40-1080.)

INSTRUCTIONS FOR PREPARATION OF THE FIRST SECTION

The numbers preceding the following paragraphs correspond with and relate to the numbers appearing on the face of this form.

Officers, including warrant officers, nurses, including reserves on active duty, cadets, and enlisted men only will be used in the patients' table on the report for the Regular Army. In time of peace, during the period of summer training, a separate report will be rendered for each character of training, such as National Guard, Reserve Corps, Reserve Officers' Training Corps, and Citizens' Military Training Camp. In time of war one report will cover all classes of military personnel. (Par. 2f, AR 40-1080.)

In classifying patients the term "injury" will be taken to mean "a traumatism produced by external causes other than those included in battle casualties." The term "battle casualty" is defined as "a traumatism occurring as the result of a hostile act of a military enemy." (Par. 2i (5) and 2j (7), AR 40-1080.)

(1) In a theater of operations the numerical designation of the unit only will be given. In the zone of the interior complete identification of unit by name and place will be made. (Par. 2h, AR 40-1080.)

(2) Indicate specifically month, day, and year. Do not use figures to indicate month. In telegraphic reports omit the year. (Par. 2i, AR 40-1080.)

(3) Weekly mean strength is obtained by adding daily strength of command (officers, nurses, cadets, and enlisted men) for each day for the 7 days, plus number of patients in hospital (officers, nurses, cadets, and enlisted men) not otherwise included in strength of command, each day for the 7 days and dividing the sum by seven. As stated in the second paragraph, warrant officers and nurses, reserve nurses on active duty, will be included. Retired officers or enlisted men, or discharged soldiers or other civilians, will not be included in this strength. (Par. 2f (1) and 2g, AR 40-1080.)

(4) All military patients in hospital during the period covered by the report appear in this column under the proper classification.

(5) All military patients in quarters during the period covered by the report appear in this column under the proper classification.

A patient admitted to quarters and subsequently to hospital during the period covered by the report will be shown as hospital only. When patients shown as "remaining from last report" in quarters have been admitted to hospital during the period covered by the report, they will be dropped in the quarters column on line (K) and taken up in the hospital column on line (F). Officers, nurses, cadets, and enlisted men ordered for record only and also those transferred informally, for purposes of this report, will be taken up as "quarters" on line (E) and dropped at the same time on line (K). (Par. 2j, AR 40-1080.)

(6) Line (L) must show the number actually remaining under treatment at the time the report is rendered.

(7) Specify cause of death, using prescribed nomenclature. Each cause of death will be followed by a number indicating total deaths from that cause since last report. (Par. 2m, AR 40-1080.)

(8) State the normal bed capacity of the hospital or unit. (Par. 2n (1) C2, AR 40-1080.)

(9) State number of emergency beds. (Par. 2n (2) C2, AR 40-1080.)

(10) State number of expansion beds. (Par. 2n (3) C2, AR 40-1080.)

(11) Record the number of vacant beds in each class. In telegraphic reports, state only the total vacant beds. (Par. 2n (4) C2, AR 40-1080.)

(12) State total number of beds actually occupied at time report is rendered. (Par. 2n (5) C2, AR 40-1080.)

(13) State the number of patients under treatment in other than Army hospitals, giving the name of the hospital. Report such other statistical data pertaining to patients or hospitalization as are called for by higher authority, and other items or notes bearing on subjects which, in the opinion of the officer reporting, should be communicated to such authority. (Par. 2j (4), AR 40-1080.)

INSTRUCTIONS FOR PREPARATION OF THE SECOND SECTION

The numbers preceding the following paragraphs correspond with and relate to the numbers appearing on the form.

Officers, including warrant officers, nurses, including reserves on active duty, cadets, and enlisted men only will be included in the tabulations in this section. (Par. 2f (1), AR 40-1080.)

Officers, nurses, cadets, and enlisted men having communicable diseases but ordered for record only will be taken up on proper line in column (8) and dropped at the same time in the column "Diseases disposed of since last report." (Par. 2j (3) (6), AR 40-1080.)

Cases informally transferred will be taken up only by the receiving hospital. (Par. 2k (3), AR 40-1080.)

Should a communicable disease develop in a military patient already in hospital or quarters, it will be taken up under column (8) on the line opposite the new disease. Similarly, should a new communicable disease arise during the course of another communicable disease, both diseases will be reported until either or both terminate. (Par. 2k (4), AR 40-1080.)

(1) In this column enter in the space corresponding to the appropriate disease classification all communicable diseases added, hospital or quarters, since last report, except those added by formal transfer in which the diagnosis on the transfer card was concurred in. (Par. 2k (1) and 2k (3), AR 40-1080.)

(2) Enter in this column all communicable diseases added since the last report, hospital or quarters, by formal transfer from other commands when the diagnosis on the transfer card was concurred in.

(3) When any communicable disease terminates, it will be disposed of in this column regardless of whether the patient remains in hospital because of some other communicable disease, noncommunicable disease, injury, or battle casualty. (Par. 2k (10), AR 40-1080.)

(4) This column will show the actual number of cases of each communicable disease under treatment, hospital or quarters, at the time the report is rendered. (Par. 2k (11), AR 40-1080.)

(5) On this line include all cases diagnosed as acute bronchitis, acute rhinitis, coryza, acute tonsillitis, acute pharyngitis, acute nasopharyngitis, acute laryngitis and pleurisy. (Par. 2l (1), AR 40-1080.)

(6) On this line indicate pneumonia developing without relation to any coexisting disease, except that pneumonia developing in association with the "common respiratory diseases" will be classed as primary pneumonia. (Par. 2l (2) (6), AR 40-1080.)

(7) On this line indicate pneumonia occurring in the course of other diseases where it is a usual or frequent complication; examples, influenza and measles. (Par. 2l (2) (4), AR 40-1080.)

(8) On this line include all cases diagnosed as colitis, diarrhea (cause determined or undetermined), fermentative diarrhea, nervous diarrhea, enteritis, mucous colitis, enterocolitis, intestinal indigestion, sigmoiditis, and intestinal toxemia, when associated with diarrhea. (Par. 2l (3), AR 40-1080.)

(9) Enter here any fever of undetermined origin. When diagnosis is made it will be dropped on the line in the column "Diseases disposed of since last report" (6) and taken up in column (8) opposite the new diagnosis. (Par. 2l (5), AR 40-1080.)

(10) Enter in this space the name of any special or important communicable disease not listed, such as anthrax, encephalitis lethargica, glanders, acute infectious jaundice, leprosy, Malta fever, rabies, tetanus, trachoma, etc. (Par. 2l (4), AR 40-1080.)

Cases of communicable disease that occur among civilians with the command will be listed under "Remarks," first section, but will not appear elsewhere in the report. (Par. 2k (9), AR 40-1080.)

Should a change in disease classification occur in a patient remaining from last report, the case will be dropped in column "Diseases disposed of since last report," and taken up under new disease classification in column (8) and the facts stated under "Remarks," first section. (Par. 2k (5), AR 40-1080.)

A readmission to hospital or quarters for a communicable disease will be taken up in column (8) under proper disease classification and facts stated under "Remarks," first section. (Par. 2k (6), AR 40-1080.)

When diagnosis on transfer card is not concurred in and changed to or from a communicable disease, this fact will be noted in "Remarks," first section, and if reclassified as a communicable disease, the case taken up under new classification in column (8). (Par. 2k (8), AR 40-1080.)

The status of the venereal diseases reported in column (8) will be indicated in the space provided. (Par. 2k (7), AR 40-1080.)

commander. If the deceased has been a member of the military service, a statement is required as to whether or not death occurred in line of duty and whether death was or was not the result of the individual's own misconduct. In case of doubt as to the line of duty status or if death was due to violent or unknown causes (except in battle) a board of officers is convened by the station commander to investigate the circumstances. If the hospital commander is also the station commander, (e.g., a general hospital), he also renders the reports required of a station commander in cases of death. These include reports to the adjutant general and notification of the death to the relative or person designated to be notified in case of emergency.

Form 86c
MEDICAL DEPARTMENT, U. S. ARMY
(Revised June 19, 1941)

STATISTICAL REPORT

THIRD SECTION

Station Hospital,
* (A) Fort School, Pa. (1) * (B) For ~~August~~ month ending with morning August 31, 1942 (2)
(Station or designation of unit)

* (C) Strength of command on last day of period covered by this report:

Officers 370 Warrant officers 18 Nurses 50 Enlisted men 8345 (3)

PERSONNEL AND TRANSPORTATION

PERSONNEL		TOTAL PERSONNEL ASSIGNED (present and absent)		EQUIPMENT	SERVICE- ABLE	UNSERV- ICEABLE	TOTAL
Officers, commissioned: (4)		W.	C.	Animals:			
Medical		20		Horse, draft			
Dental		4		Horse, riding			
Veterinary		-		Mule, draft			
Administrative		4		Transportation:			
Sanitary				Ambulances, animal drawn (9)			
Internes				Ambulances, motor: (9)			
Contract surgeons				Metropolitan			
(W) *Total		28	-	Field, 4 x 2			
				Cross-country, 4 x 4			
(X) *Army Nurse Corps (5)		50	-	Cars, 5-passenger, light, sedan			
				Litter carriers, field (9)			
				Litters, with slings (9)			
(Wa) *Officers, warrant		-	-	Motorcycles, solo			
				Motorcycles, with side car			
ALLOTTED				Trailer, 1-ton cargo			
GRADE TECH				Trailer, tank, water, 250-gallon			
2	Master sergeants	2		Trailer, 2-horse van			
3	Technical sergeants	3		Truck, tank, 750-gallon			
1	First sergeants	1		Truck, 1-ton bantam			
11	Staff sergeants	10	6	Truck, 1-ton carry-all			
17	Sergeants	14	12	Truck, 1-ton command			
9	Corporals	9	20	Truck, 1-ton cargo			
77	Privates 1st class	65		Truck, 1-ton cargo with winch			
113	Privates	88		Truck, 1-ton pick-up			
233	42 Total	192	38	Truck, 1-ton 4 x 4, reconnaissance			
(Y) *Total	Enlisted Personnel		230	Truck, 1 1/2-ton cargo			
				Truck, 1 1/2-ton cargo with winch			
All others attached for duty: (7)		W.	C.	Truck, 1 1/2-ton dump			
Officers				Truck, 2 1/2-ton cargo			
Enlisted men				Truck, 2 1/2-ton cargo with winch			
Civilians MD		11	-	Truck, 3-5-ton tractor			
				Wagon, escort			
Aggregate			319				

(Number of Privates, 1st class, and Privates rated as Specialists) { 1st class 2d class 3d class
(No longer applies) { 4th class 5th class 6th class
(Number of allotted ratings vacant, by class)

Remarks: (8)

(Attached to this report will be a roster of all Medical Department officers showing: Name, rank and organization, component (RA, Res, NG), and principal duty performed during the month.)

JOHN J. DOE, Colonel, M. C., U. S. A.
(Name) (Rank) (Official designation) Surgeon.

Preparation of remains. The surgeon is responsible that the remains are prepared properly; his responsibility does not cease until the remains are removed for burial or shipment. In all cases a medical officer inspects the remains after they are prepared and makes a certificate as to the identity of the body and whether it is properly clothed. The quartermaster is responsible for the shipment and burial of the remains.

Autopsies. In the military service autopsies may be performed when, in the opinion of the surgeon, they are necessary to determine the cause of death.

Pharmacy Management

A commissioned officer is given general supervision of the pharmacy in addition to his primary duties, and a responsible noncommissioned officer or experienced technician (pharmacist) is placed in direct charge.

Pharmacy Supplies. Supplies for the pharmacy are drawn from the medical supply officer daily or at stated intervals. Issues to the wards and departments of the hospital are made daily upon prescriptions and requisitions.

The metric system is generally used in writing prescriptions and in keeping records.

Prescription Files. Three prescription files are maintained: one for alcoholics and narcotics; one for prescriptions for civilians, containing drugs other than alcoholics and narcotics; and one for routine prescriptions.

Record of Alcoholics and Narcotics. An accurate record is kept of all alcoholics and narcotics received and expended. This is verified at least every month by a medical officer. Poisons, alcoholics, and habit-forming drugs are kept in separate lockers and issued only on order of a medical officer.

Civilian employees may purchase medicine when prescribed by a medical officer. Funds so collected are deposited at the end of every month with the nearest finance or disbursing officer for deposit in a United States depository to the credit of the Treasurer of the United States under the special fund "Replacing medical supplies," for the next succeeding fiscal year; for example, those deposits made in the fiscal year 1939 revert to the appropriation for the fiscal year 1940. A report of "Proceeds of sales of medicines to civilians" is rendered by the responsible officer by letter direct to the surgeon general.

Sales of Medicines to Civilian Employees. United States civil employees injured while on duty are entitled to first aid, medical care, and treatment in established institutions of the Army under the employees' compensation act. No charges for medicines, drugs, etc., to the patient are made therefor, but bills are sent to the United States Employees' Compensation Commission, Washington, D. C.

Dental Administration

Dental Reports. The senior dental officer of a command or station is responsible to the surgeon for the preparation, authentication, transmission, and safekeeping of the reports, returns, and records prescribed for the Dental Corps. (AR 40-1010.) The important dental reports required are the Report of Dental Service, and the Statement of Expenditure of Special Dental Materials, both submitted monthly.

The *monthly* Report of Dental Service is submitted from each military station and separate command where a dental officer has been on duty during the month. This is rendered on Form 57, M.D., and is signed by the dental surgeon. It is a compilation of dental activities for the period and includes:

Station or command with location, date, and period covered.

Total number of admissions to the dental clinic for routine and emergency treatment of military personnel and others, each item listed separately.

Total number of sittings given, military personnel and others, listed separately.

Latest available dental classification of the command with the total number in each class.

Cases diagnosed, operations performed and their nature. (The primary cause for extractions is not listed).

Number of officers on duty, assigned and attached, and the type of duty (e.g., surgeon, prosthetist, oral surgical section assistant, etc.).

Enlisted personnel on duty in the clinic, listed by grade and duty.

Civilian employees, their number and occupation.

General remarks.

The *monthly* Statement of Expenditure of Special Dental Materials (Form 18 b, M.D.) is submitted from each military station or separate command where a dental clinic with laboratory facilities is established and a dental officer is in attendance. The report is rendered whether or not special dental materials have been expended during the period covered by the report. It is signed by the dental surgeon or dental officer responsible for dental materials. It contains an accurate account of the dental materials expended dur-

INSTRUCTIONS

I

GENERAL INSTRUCTIONS FOR THE PREPARATION OF ALL SECTIONS OF THE STATISTICAL REPORT (FORMS 86a, 86b, 86c, ETC.)

(1) **PLAN AND PURPOSE OF THE REPORT.**—The Statistical Report comprises several sections in each of which is incorporated special information required by the various divisions of The Surgeon General's Office and the office of the Chief Surgeon in a theater of operations. The sections are designed to furnish the following information: first section (Form 86a), data concerning sick, injured, and battle casualties, hospitalization and other statistical data; second section (Form 86b), movement of communicable disease; and third section (Form 86c, status of Medical Department personnel, other personnel attached to the Medical Department for duty and transportation and material available for utilization by the Medical Department. The third section relates solely to Medical Department personnel, or personnel attached thereto, within the theater sections (first and second sections) include statistical data covering the entire command of which the Medical Department unit forms an integral part. Additional sections may be adopted as necessary for their rendition arises. (Pars. 2a and 2b, A.R. 40-1080.)

(2) **BY WHOM RENDERED.**—All Medical Department units will render this report. In time of peace separate reports will be rendered for each character of training unit. (Par. 2c, A.R. 40-1080.)

(3) **TIME INTERVAL FOR RENDITION.**—Unless otherwise directed by competent authority, the first and second sections of the report normally will be rendered weekly to include data appearing on the morning report for Saturday, and the third section as of the last day of each month. Under exceptional circumstances any section of the report may be rendered daily. (Par. 2d, A.R. 40-1080.)

(4) **CHANNELS THROUGH WHICH RENDERED.**—In time of peace, and in the Zone of the Interior in time of war, the statistical report will be made in triplicate, one carbon copy forwarded direct to The Surgeon General, U. S. Army, Washington, D. C.; the original copy to the corps area or department surgeon; and the second carbon copy retained, except that detachments, regiments, and other organizations forming part of a

division, camp, or subordinate administrative district which renders a consolidated report will render the report in duplicate only, forwarding the original to the next higher authority, who will consolidate the reports of units under his jurisdiction in triplicate and forward as directed above. (Par. 2e (1), A.R. 40-1080.)

In a theater of operations in time of war the reports, unless otherwise directed by competent authority, will be made in triplicate, one carbon copy forwarded direct to the Chief Surgeon of the forces, the original through medical channels to such intermediate administrative office as may exist, and the second carbon copy retained, except that detachments, regiments, and other organizations forming part of a division, camp, or subordinate administrative district which renders a consolidated report will render the report in duplicate only, forwarding the original to the next higher authority, who will consolidate the reports of units under his jurisdiction in triplicate and forward as directed above for a theater of operations. (Par. 2e (2), A.R. 40-1080.)

(5) **EXPLANATION OF SPECIAL SYMBOLS.**—The purpose of the capitals in parentheses (A), etc., and the asterisk (*) is explained in paragraph (7). The Arabic numerals in parentheses (1), (2), etc., refer to the paragraphs in special instructions for the preparation of the section of the report (Form 86a, 86b, or 86c) in which the details of the preparation are covered.

(6) **TELEGRAPHIC REPORTS.**—Telegraphic reports will be rendered only when specifically required or in emergency. Such reports will be forwarded in code and will comprise the data on all items on the report marked with an asterisk. Capitals (A), (B), etc. (immediately preceding or following the heading), will be used as code letters to number the headings of the report. In the telegram, all sections of the completed report (86a, 86b, 86c, etc.) will be forwarded by mail as provided for in paragraph (4). (Par. 2f, A.R. 40-1080.)

II

SPECIAL INSTRUCTIONS FOR THE PREPARATION OF THIRD SECTION, STATISTICAL REPORT (FORM 86c) (See Par. 2, c and p, A.R. 40-1080)

The Third Section will be prepared by the senior medical officer of every station and command in the field, including commands and units under direct control of the War Department. Thus this report will be rendered by all Medical Department Schools, Corps Area Laboratories, Medical Department Training Centers and Detachments, Medical Supply Depots, newly formed cadres, Medical Department, Headquarters, etc., even though they are not responsible for the treatment of the sick and do not render returns on Form 86a.

The numbers preceding the following paragraphs correspond with and relate to the numbers appearing on the face of this form

(1) In a theater of operations the numerical designation of the unit only will be given. In the Zone of the Interior complete identification of unit by name and place will be rendered. In telegraphic reports omit the year.

(2) Indicate specifically month, day, and year. Do not use figures to indicate month. In telegraphic reports omit the year.

(3) Strength of command on last day of period covered by report will include officers, warrant officers, nurses, and enlisted men (present and absent). Discharged soldiers or other civilians with the command will not be included in this strength.

(4) When any National Guard or Reserve Officers are on active duty, the fact will be stated on the proper line. Thus: Medical, Dental, etc. (Reg. 2, NO 5; Res. 2) Total 9.

(5) Regular, reserve, or civilian nurses on duty at a station or with the command will be shown. Thus: Army Nurse Corps (Reg. 20; Res. 5; Civ. 3) Total 28.

(6) Under "Enlisted Personnel, M. D." will be noted the number allotted by the War Department and in the proper column—Total present, etc. Following (Y) "Total" the numerical strength will be divided as to Regular Army, Regular Army Reserve, National Guard, and Selectees. Thus: (Y) Total (Reg. 10; H.A.R. 2; NO 30; S.S. 40) Total 102.

(7) Military personnel, other than Medical Department, attached for duty, such as Quartermaster Corps, Finance Department, etc. Under civilians will be shown those paid from M. D. funds and all others. Thus: Civilians (M. D. 40; all others 50) Total 80.

(8) Report under "Remarks (8)" statistical data pertaining to personnel and transportation as called for by higher authority. In case of each enlisted man in the first three grades upon first joining his station or command, the name of the noncommissioned officer concerned and the number of his dependents will be noted. Any change in the number of dependents will be noted on subsequent reports.

(9) In each column insert both the number being used by or under the direct control of the Medical Department and immediately thereafter, in parentheses, any additional number at the station, including those stored as a War Reserve. Zero will be used in the appropriate column or columns marked (9) to show that an entry has not been overlooked.

Service-able Unservice-able Total
Example: Ambulances, motor, etc. 3 (8) 0 (1) 3 (9)
This means that there are 12 ambulances at the station, only 3 of which are being used by the Medical Department.

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Plate 9b Statistical Report (Reverse).

ing the period. The name and status of the persons for whom expenditure is made, appliances used, and amounts of special dental materials expended are shown in each case. Amounts of special dental materials on hand at last report, amounts received, amounts expended, and amounts remaining on hand at the close of the period are entered together with such other explanatory remarks as may be necessary.

Both the monthly report of services and the monthly statement of expenditures are forwarded through medical channels before the fifth day of the next succeeding month, sufficient copies being furnished to permit retention of carbon copies in the intermediate offices of transmission, as follows:

From any station or command under the immediate control of the War Department directly to the Surgeon General, unless otherwise ordered by him.

From any other organization, station, or hospital to the chief surgeon of an expeditionary force in a theatre of operations, or to the surgeon of the corps area or department, for transmission to the Surgeon General.

Form 53 A
MEDICAL DEPARTMENT, U. S. ARMY
(Revised May 31, 1989)

CLINICAL RECORD BRIEF

Register No. 5678 Hospital Station Hospital, Fort School, Pa.
Name Brown, Adam P. Serial No. 45,678,910
Grade Cpl Co. C Regt. and Arm or Service 1st Infantry
Age 22 Race W Nativity N.Y.
Service 5/12 Date of admission August 12 1942
Source of admission Informal transfer from Disp. 1st Inf. Ft School, Pa.
Station Ft School, Pa.
Ward A-8 Previous admission None
Religion R.Catholic Home address 1160 Halsey St. Brooklyn, N.Y.
Name and address of nearest relative Mr. James E. Brown (father)
same address as above.
RAB
(Initials of admitting officer)

Disposition	Duty	Date	September 28	19 42
-------------	------	------	--------------	-------

Final diagnosis: Fracture, simple, complete, transverse, one inch from distal end, right radius; accidentally incurred when patient slipped and fell on outstretched right arm while running the obstacle course at Fort School, Pa, August 12, 1942.

Additional diagnoses (Complications, special treatment and operations):

August 12, 1942:- Fracture, closed treatment of,
with plaster of Paris.

Line of duty Yes
Condition on completion of case Cured
Transfer diagnosis confirmed or not confirmed Confirmed
Autopsy -

Richard Roe,
1st Lt, M.C.

A full record of dental patients at every military station or separate command where a dental officer is on duty is made on register cards, Form 79 M.D. For authorized abbreviations and diagnoses see pars. 6 and 7, AR 40-1010. These cards collectively form the dental register, each card being a case record. When a patient is confined to quarters or hospital as a result of dental conditions, the dental surgeon is required to furnish the surgeon with a duplicate of the case record on Form 79 M.D. It is then incorporated in the patient's clinical record.

Veterinary Administration

Veterinary Reports. The senior veterinary officer of a station or other command is responsible for the preparation, authentication, transmission, and safekeeping of the reports, returns, and records prescribed for the use of the Veterinary Service. In the absence of a veterinary officer, the surgeon takes charge of veterinary property and renders all reports pertaining to the veterinary service unless otherwise specifically excepted. An attending veterinarian or a civilian veterinarian rendering professional service to a command will, in the absence of a veterinary officer, sign or initial (if the name is typed in) register and report cards of sick and wounded animals.

A *veterinary history* of each permanent station is kept by the veterinarian in a loose-leaf binder. A copy of the veterinary sanitary report (AR 40-2255), the meat and dairy hygiene report (AR 40-2260), the forage inspection report (AR 40-2085), and the veterinary report of sick and wounded animals (AR 40-2245) is filed therein in a single chronological sequence. Additional sheets, measuring about 13 by 8 inches, for noting the occurrence of epizootic diseases and other data of general and veterinary interest are inserted as occasion requires at their proper chronological places. The prescribed endorsements on sanitary reports and W.D. Form No. 110 (Report of Veterinary Meat and Dairy Hygiene and Forage Inspection) are invariably made on the copy filed in the veterinary history.

A *clinical record* (Form 55 M.D., modified) is kept for each patient in a veterinary hospital establishment. W.D. Form No. 55aV (Clinical Record Brief, Veterinary) and W. D. Form No. 55j (Clinical Record, Treatment) are used in every case; the other lettered blanks of W.D. Form 55 M.D. are used as the nature or importance of the case may warrant. Upon completion of the case all the sheets of the clinical record are arranged in their proper order, fastened together at the top, all entries completed, and the record signed by the ward veterinarian. The record as completed is then sent to the hospital office with the next morning report of the ward. It is filed according to the register number thereon.

A *report of veterinary personnel* is rendered monthly on W.D., M.D. Form No. 86c (Statistical Report, Third Section—Personnel and Transportation), in accordance with section IV, AR 40-2245.

ADMINISTRATION OF MEDICAL UNITS

General. The purpose of the information which follows is to present illustrative material and explanatory memoranda about the preparation of required forms and records which pertain to the administration of any military unit. They are used within Medical Department units in the same manner and for the same purposes as in all branches of the service. The records described pertain particularly to the routine administrative requirements of the company, such as a company which constitutes a part of a medical regiment, or more commonly a medical detachment of a station hospital. The same methods would be applicable to the medical detachment of an infantry or artillery regiment, or to medical detachments of other field forces.

The readoption by the Army of a centralized system of handling personnel records has relieved company and detachment commanders of much detailed labor in the conduct of routine administrative procedures. The handling and maintenance of the Service Record (the military history of the individual soldier), qualification cards, payrolls and other vouchers, and Reports of Change are now the responsibility of the personnel officer. The records which are retained by the company commander are the Morning Report, the Daily Sick Report, the Duty Roster, the Individual Clothing and Equipment

Records, Memorandum Receipts and other property records (in tactical units, the company property book), the company fund and Council Book, and Company Orders.* The company remains an important administrative unit because many of the records which it maintains are records of original entry. A few of the important company records are discussed below.

Morning Reports. *Importance as a record.* In the organization of a new company, troop, or battery, it is of paramount importance that a morning report be started on the first day as this report is the official record which accounts for all officers and enlisted men of the organization. All military personnel, on active duty, are accounted for daily on a morning report. Since the morning report is not only the daily history of the organization but also furnishes the basic information for many other vital records, it is of great importance that care be taken to insure that it is correctly made out in every detail.

Day of month	OFFICERS										ENLISTED MEN, INCLUDING SPECIALISTS																				Technicians <i>Technicians</i> Present and Absent									
	Present					At-tached					Duty																				Present and Absent									
	For Duty					Absent					Present										Absent										For Duty					For ration only				
	Captain and Field Off.	1st Lieutenants	2d Lieutenants	Special duty	Sick	Present	Absent	At-tached	Master Sergeants	1st Sergeants	Technical Sergeants	Staff Sergeants	Sergeants and Technicians	Corporals and Privates	Privates, 1st Class	Privates	Recruits	Total for duty	On special duty	Sick in hospital	Sick in quarters	In arrest	In confinement	Total present	Detached service	Sick	Without leave	In arrears for confinement	Missing in action	Total absent	Total present and absent	Present	Absent	For ration only	1st class	2d class	3d class	4th class	5th class	6th class
1	3	1	2	2	1				1	5	9	13	23	50	101	1	3	1	106	2	1	105	2	1	106	2	1	10	116	3	9	2	5	7						
2	2	1	2	3	1				1	5	8	13	23	49	99	1	4	1	103	2	1	103	2	1	105	2	1	11	116	3	9	2	5	7						
3	2	1	2	3	1				1	5	8	12	23	49	97	1	4	1	103	2	1	103	2	1	105	2	1	12	115	3	59	2	5	7						
4	2	2	2	2	1				1	4	8	12	24	49	98		4	1	103	2	1	103	2	1	105	2	1	12	115	3	59	2	5	7						
5	3	2	2	2	1				1	4	8	12	24	49	98		4	1	103	2	1	103	2	1	105	2	1	12	115	3	59	2	5	7						
6	3	2	2	2	1				1	4	8	12	24	49	98		4	1	103	2	1	103	2	1	105	2	1	12	115	3	59	2	5	7						
7	3	2	2	2	1				1	4	8	12	24	49	98		4	1	104	2	1	104	2	1	106	2	1	11	115	3	59	2	5	7						
8	3	2	2	2	1				1	4	8	11	24	49	97		4	1	104	2	1	104	2	1	106	2	1	11	115	3	59	2	5	7						
9	3	2	2	2	1				1	5	8	11	24	50	99		3	1	105	2	1	105	2	1	107	2	1	11	116	3	59	2	5	7						
10	3	2	2	2	1				1	5	8	11	24	50	99		3	1	105	2	1	105	2	1	107	2	1	11	116	3	53	2	5	7						

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Plate 11. Model "Strength" Section of the Morning Report.

Preparation. The company morning report (W.D., A.G.O. Form No. 1) is usually prepared by the 1st sergeant, under the supervision of the company commander, and submitted each morning to the commander of the next higher administrative unit. All entries in the morning report are made in black ink or indelible pencil, and are initialed by the company commander daily following the last entry for that day under the "Remarks" section. This record is submitted daily to the personnel section where it is inspected and information extracted. The personnel officer then initials the daily entry in the column headed "Day of the month." Morning reports cover the period from midnight to midnight; thus the report for the period commencing at midnight 3d-4th, and ending at midnight 4th-5th, is submitted on the morning of the 5th. The condition of the company at the end of the day is shown by tabulation, by appropriate explanatory remarks and any changes that have occurred in the duty and status of military personnel during the day.

Sections. The morning report is divided into four sections: "Strength," "Remarks," "Station and Record of Events," and the "Ration Account" sections, and will be considered in that order.

In connection with entries made in morning reports it is necessary to understand the meaning of the following terms:

Assigned means permanently belonging to the company.

Casual or attached means temporarily with the company.

Special duty means performing some duty other than routine duties which would be performed as a member of the organization.

* A complete discussion of this subject will be found in *Company Administration and Personnel Records*, by Lt. Col. C. M. Virtue, The Military Service Publishing Company, Harrisburg, Pennsylvania.

Detached service means on some duty which necessitates absence from the post for more than twenty-four hours.

"Strength" section. On pages 4, 8, and 12 of the morning report form will be found spaces to make itemized numerical entries necessary to show the daily status, by grade, of all officers and enlisted men belonging to the company. Changes occurring from day to day will be shown by appropriate changes in the numerical entries. (Plate 11, Model "Strength" Section of Morning Report, is self-explanatory.)

"Remarks" section. The "remarks" section is provided for the purpose of recording all changes of duty and status of officers and enlisted men by name and grade. If there is no change of status, the notation "No change" is entered. (See Plate 12.)

Day of month	REMARKS
1	No change. <i>Gn</i>
2	<i>Maj Poole duty to hosp, Capt Leeds assumed commd; Pvt Johnson duty to AWOL 3 PM;</i>
3	<i>Sgt Bick duty to hosp. Gn</i>
4	<i>50 E.M. atchd for rations 2 PM; Tech 3 gr Brown duty to tr 7 days; Cpl Featherstone</i>
5	<i>duty to disch. Gn</i>
6	<i>Lieut Bryan hosp to duty; Pvt 1st Luke SD General Mers to duty. Gn</i>
7	No change. <i>Gn</i>
8	<i>Maj Poole hosp to duty, assumed commd. Gn</i>
9	<i>Pvt Daniels, 15 int, atchd for duty; Pvt Johnson AWOL to cont 7 AM. Gn</i>
10	<i>Cpl Taylor gtd; Sgt Tech 4 gr Myers duty to ar. Gn</i>
11	<i>Capt 1st Sgt McPherson assn to and fr co 3 PM; Pvt Green, MR, hosp to duty. Gn</i>
12	<i>G.E.M. atchd for rations. Left Co. Gn</i>

Plate 12. Model "Remarks" Section of the Morning Report.

Practically everything that happens officially to a member of a company will be covered under "Remarks." Some of the more important entries will be: changes in commands, changes in the duty status of members of the company, such as discharges, change in grades, transfer, absences, furloughs, arrest, confinement, and sick. As examples:

Change in command: "Capt Doe, duty to hosp; Lt Smith assumed command."

Discharges: "Pvt Jones, duty to disch."

Transfers: "Sgt Smith, trfd to 15th Inf."

Absences: "Sgt Pore, duty to fur 6 days." "Pvt King, duty to AWOL 3 P.M."

Arrest: "Cpl Henry, duty to ar."

Day of month	STATION AND RECORD OF EVENTS
1-4	<i>Stanton, Mich. Usual camp duties.</i>
5	<i>Craneboro, Mich. Left Stanton 7:10 AM on practice march. Arrived Craneboro 3:20 PM. Distance marched 20 miles.</i>
6	<i>Stanton, Mich. Left Craneboro 7:15 AM. Arrived Stanton 7:17 PM. Distance marched 20 miles. Condition at troops good.</i>
7-9	<i>Stanton, Mich. Usual camp duties.</i>
10	<i>Stanton, Mich. Service Command Commander visited camp at 7:00 PM and reviewed all the troops.</i>

Plate 13. Model "Station and Record of Events" Section of the Morning Report.

Confinement: "Pvt Ball, duty to conf."

Sick: "Sgt Smith, duty to sk in qrs."

Change in grade: "Pvt Doe aptd corp."

"Station and record of events" section. The station and record of events section will be found in the last few pages of the morning report form. Here are entered remarks in reference to the location of the company and such events as may take place, such as changes of station, with dates and distance marched or traveled; engagements including names, places; the dates of those killed, wounded or missing in action; and such other items of interest relating to the company. (See Plate 13.)

RATION ACCOUNT

VALUE OF ONE RATION DURING MONTH, \$ 5569

MEN AUTHORIZED TO MESS SEPARATELY

NAME AND GRADE	PERIOD	NO. OF RATIONS
Grant, JC, 1st Sgt	1-10	10
Featherstone, TA, Cpl	1-3	3
Myer, L D, Tech 4Gr	1-7	7
Number of rations commuted		<u>20</u>
Ten per cent addition		<u>2</u>
Total		<u>22</u>
Total commutation due men messing separately.		<u>\$12.25</u>

MEN MESSING WITH ORGANIZATION

DATE	Daily Average Strength for Rations	No. Men Messing with Organization	+ or - Correction for Percentage	Net No. Rations Due Organization
1	115	112	-	112
2	114	111	-	111
3	127	124	-	124
4	161	159	-8	151
5	161	159	-8	151
6	161	159	-8	151
7	162	160	-8	152
8	162	161	-8	153
9	163	162	-8	154
10	160	159	-8	151
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
TOTAL RATIONS DUE ORGANIZATION:				<u>1410</u>

Plate 14. Model "Ration Account" Section of the Morning Report.

"Ration account" section. A ration is the allowance for the subsistence of one individual for one day; *i. e.*, it provides for three full meals for one person.

The daily average strength of rations is the number of persons for whom the company is entitled to subsistence. This is found by dividing by three the total number of meals (breakfast, dinner and supper) served in the company, as shown by the figures in the *strength* section of the morning report and supported by the entries in

the *remarks* section. The daily average for rations, less the number of men authorized to mess separately, gives the entries for the column headed "No, men messing with organization." (See Plate 14.)

Authorized abbreviations. The list of abbreviations given below is a partial list of those authorized by AR 850-150 for use in connection with morning reports, pay rolls, rosters, returns, and other military records, and no others are authorized except some exceptional cases which do not fall within the purview of this chapter:

Absent without leaveAWOL
 ActingActg
 AppointedAptd
 Army RegulationsAR
 ArrestAr
 Article of WarAW
 AssignedAsgd
 AttachedAtchd
 AuthoritiesAuth
 BarracksBks
 BattalionBn
 BrigadeBrig
 BuglerBglr
 CaliberCal
 CaptainCapt
 CasualCas
 ChangesC
 CircularCir
 Citizens' Military Training CampCMTc
 Civil authoritiesCAuth
 ClassCl
 Coast Artillery CorpsCAC
 ColonelCol
 CommandingComdg
 Commanding GeneralCG
 Commanding OfficerCO
 CompanyCo
 Confined or ConfinementConf
 CookCk
 CorporalCpl
 Corps AreaCA
 Corps of EngineersCE
 Corps of Engineers ReserveEngr-Res
 Current seriescs
 Detached Enlisted Men's ListDEML
 Detached Officers' ListDOL
 Detached serviceDS
 DischargeDisch
 Dishonorable dischargeDD
 DismissedDismd
 DisratedDisr
 Distinguished Service CrossDSC
 DivisionDiv
 DocumentDoc
 EnlistedEnl
 ExcellentEx
 Expert riflemanER
 Expiration of term of serviceET'S
 Field Service RegulationsFSR
 Final statementFS
 Finance DepartmentFD
 First1st
 First class1cl
 Fromfr
 FurloughFur
 GeneralGen
 General Court-MartialGCM
 General ordersGO
 General Staff CorpsGSC
 GradeGr
 HeadquartersHq
 HospitalHosp

InclosureIncl
 IndorsementInd
 InfantryInf
 Infantry ReserveInf-Res
 Inspected and condemnedIC
 Inspector GeneralIG
 Inventory and Inspection ReportI & I Report
 JoinedJd
 Leave of absenceLv
 LieutenantLt or Lieut
 Lieutenant ColonelLt Col
 Line of dutyLD
 Machine gunMG
 MajorMaj
 Major GeneralMaj Gen
 Manual for Courts-MartialMCM
 MarksmanMm
 MedicalMed
 Medical CorpsMC
 MemorandumMemo
 Motor transportMT
 MountedMtd
 National GuardNG
 Officer of the dayOD
 Olive drabod
 OrdersO
 Organized ReservesOR
 Over, short and damagedOS&D
 ParagraphPar
 Pay rollP/R
 Post ExchangeP Ex
 PrivatePvt
 Private, first classPvt 1cl
 Professor of Military Science and Tactics PMS&T
 QuartermasterQM
 Quartermaster CorpsQMC
 RecruitRct
 ReducedRd
 ReenlistmentReenlmt
 RegimentRegt
 Regular ArmyRA
 RelievedReld
 ReserveRes
 Reserve Officers' Training CorpsROTC
 RetiredRet
 Same datesd
 Second2d
 SergeantSgt
 Special Court-MartialSCM
 Special DutySD
 SpecialistSpec
 Special OrdersSO
 StationSta
 StudentStud
 Summary CourtSum CM
 Training RegulationTR
 TransferredTrfd
 UnassignedUnasgd
 Verbal ordersVO
 Very goodVG
 War DepartmentWD
 Warrant officerWO

man's name, the date when he last performed the duty specified, as indicated in Plate 16. When a man is again detailed for the same duty, a line is drawn through the last date on which he performed that duty and the new date is inserted.

Guard duty section. In connection with the *Guard Roster Section* of the duty roster there are certain mandatory abbreviations which must be used. They are as follows:

A	.....	Absent without leave.
Ar	.....	Arrest in quarters.
C	.....	Confinement.
DS	.....	On detached service.
F	.....	On furlough.
P	.....	On pass.
Rct	.....	Recruit.
SD	.....	On special duty.
Sk	.....	Sick.

No.	NAME.	NAME.	NATURE OF DUTY AND WHEN LAST PERFORMED.				
			Charge of Quarters and Room Orderly.	Fatigue.	Kitchen Police.		
1	1 ST SGT	STERN					
1	SGT	STILLWELL	MAY 24 8 30	APR 8 10			
2		RANDALL	MAY 45 2 9	APR 8 11			
1	CORP	PUCKETT	MAY 8 14 15	APR 8 14			
2		LAWRENCE	MAY 8 14 16	APR 8 15			
3		PETERSON	MAY 8 16 17	MAY 6 18			
1	PTICL	KING		MAY 8 19	MAY 2 8		
2		DARDE		MAY 8 20	MAY 2 8		
3		JEFFERSON		MAY 20	MAY 8 9		
1	PVT	COBB		MAY 8 21	MAY 8 9		
2		FLANAGAN		MAY 16 22	MAY 8 10		
3		HANNAH		MAY 15	MAY 8 10		
4		FLEMMING		MAY 8 21	MAY 8 11		
5		NORWOOD		MAY 16	MAY 8 11		

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Plate 16. Model "Roster for Other Duties."

In keeping the *Guard Roster Section*, if a man is available for guard duty, there is placed opposite his name the number showing the number of days since he performed guard duty. If a man is in arrest, in confinement, or absent without leave, he is considered available for guard in computing the number of days since he performed guard duty. (See Plate 17.) This is not true, however, if the man is sick, on furlough, or on detached service.

Allotment of Pay. Allotment as used in the military sense means a definite portion of the pay of an officer or soldier which is authorized to be paid to another person, or institution, in a manner prescribed by the Secretary of War. The purposes for which allotments may be made are covered in *Army Regulations*. When an officer or soldier makes an allotment it is purely a voluntary act on his part and he may revoke the allotment at any time he may so desire, or at any time he may make any change he desires as to the monthly rate or period covered by the allotment.

Allotments are of two general classes: those which are made for the support of dependents, for the payment of premiums on commercial life insurance, or for deposit to a designated account with a bank, designated as "Class E Allotments"; and, those which are made for the payment of premiums on government life insurance, designated as "Class D, or Class N Allotments." These allotments are made out on War Department, A.G.O. Form No. 29, and must comply with the provisions of army regulations as set forth in AR 35-5520. When allotments become effective the amount allotted is deducted each month from the allotter's pay, proper entries having been made on the pay roll on which the allotter is paid to insure that such an amount is withheld by the local disbursing officer. A check for the amount of the monthly allotment is mailed to the allottee by the Finance Department. For the duration of the war all allotments will be continued in force, regardless of the expiration date, unless voluntarily terminated by the allotter.

When an allotment is discontinued the deduction must be continued until notification is received from the Finance Officer, U. S. Army, acknowledging receipt of notification of discontinuance.

Pay Reservations. To permit individuals in the military service to purchase war bonds, reservation of pay in the amount of \$1.25 or multiples thereof are authorized. Requests for reservation of pay for this purpose (Class A Pay Reservations) are made on War Department, A.G.O. Form No. 29-5, and entries corresponding to the amount of pay reserved are made on the pay roll in the portion of the "Allowances" column headed "Subs." Pay so reserved is held by the Chief of Finance, War Bonds Division until a sufficient amount has accrued to purchase the bonds designated.

Deductions For Dependents. The Service Men's Dependents Allowance Act provides for deductions from the pay of enlisted men in the grades of Private to Sergeant, inclusive. Under this act dependents are divided into two classes: Class A—a wife and/or

GUARD ROSTER.																																No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
	1	2	3	4	5	6		1	2	SK	SK	3	4	5	6		1	2	3	4	F	F	F	F	F	F	F	F	5	6		
	1	2	3	4	5	6		1	2	3	4	5	6		1	2	3	4	5	6		1	2	3	4	SK	SK	SK	5			
	1	2	3	SK	SK	4	5	6		1	2	3	4	5	6		1	2	3	4	5	F	F	F	F	F	F		1	2		
	1	2	3	4	5	6		1	2	3	4	5		1	2	3	SK	SK	4	5	6	7		1	2	3	4	5	6			
	1	2	3	4	5		1	2	F	F	F	3	4	5	6		1	2	3	4	5		1	2	3	4	5					
	1	2	3	4		1	2	SK	SK	SK	3	4		DS	DS	DS	DS	DS	1	2	3	4		1	2	3	4	5				
	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4	5		1	2	3	4	5	6		1	2		
	1	2	3	4		1	2	3	4		1	2	3	SK	4		1	2	3	4		SK	1	2	3	4		1	2	3		
	1	2	3	4	5	6		1	2	C ³	C ⁹	C ⁵		1	2	3	4	5	6		DS	DS	DS	DS	DS	DS	DS	DS	DS	DS		
	1	2	3	4	5	6		1	2	3	4	5		1	2	3	4	5	6		1	2	SK	SK	3	4	5	6	7			
	1	2	3	4	5	6		1	2	3	4	SK	SK	5		1	2	3	4	5	6	7		1	2	3	4	5	6	7		
	1	2	3	4	5	6		1	2	3	4	5	6		1	2	3	4	5	6	7		1	SK	SK	2	3	4	5			
	1	2	3	4	5	6		1	2	A ³	A ⁹	A ⁵	C ⁶	C ⁷	C ⁸	C ⁹	C ¹⁰	C ¹¹	C ¹²	DISCHARGE D												

Plate 17. Model "Guard Roster."

children, and Class B—parents, grandchildren, brother or sister. For enlisted men with Class A dependents, deductions are mandatory, but in the case of Class B dependents are entirely voluntary. In the case of Class A dependents, \$22.00 is deducted from the soldier's pay to which the Government will add an allowance of \$28.00 for a wife only, \$40.00 for a wife and one child with an additional \$10.00 for each additional child. Government allowances in the case of Class B dependents are similarly scaled but for lesser amounts. Application for this allowance is made on War Department A.G.O. Form No. 625, and the required deductions are entered monthly on the pay roll as Class F deductions. The column headed "Spec. Rating" is used for this purpose. (See Plate 18, Model Pay Roll.)

Preparation of Pay Rolls. *Permanent record.* Soldiers are paid on pay rolls (W. D. Form No. 366) which are prepared and certified in triplicate by the organization commander. In view of the fact that these pay rolls are filed in the General Accounting Office as permanent records and may be subsequently used in connection with settlement of claims or questions affecting the pay of the men concerned, organization commanders should exercise great care that they are correctly made out.

Entries. A pay roll consists of one copy of W. D. Form No. 366 and as many forms No. 366a (inside sheets) as may be necessary. Names of all enlisted men in the organization will be entered on the pay roll from the date of receipt of notice of their assignment, whether or not they have joined. The names of enlisted men should be entered in the column "names, present and absent, grade and serial number" in the order of their grades and alphabetically within each grade. The soldier's name and serial number, date of enlistment, number of years service, and specialist rating, if any, should be written on the same horizontal line under proper column heading. Necessary remarks should be entered below the soldier's name, the first line only commencing one inch from the left edge of the page, and such remarks may continue through but

Page 6 MODEL REMARKS
 PAY ROLL of 1436th Service Unit from July 1, 1942 to July 31, 1942
 (Organization) (Rest. or corps)

NAMES, PRESENT AND ABSENT, GRADE, AND SERIAL NUMBER	DATE OF ENLISTMENT	No. Yrs. Ser.	Cl F Ded	ALLOWANCES		Qrs.	DEDUCTIONS		
				Cl A Pay Res			Gov't Ins Cl-A	Allotment Cl-E	Gov't Laundry
<u>REGULAR ARMY</u>									
<u>STAFF SERGEANTS CONTINUED</u>									
1. Shughart, Caldwell T., 7022772	Sept 25/41	9			35.65				
Due sol rental of Qtrs Alvs July 1, /42 to July 31/42 incl for dependents Mrs Gladys Shughart (lawful wife), 273 S. Pitt St., Carlisle, Pa.									
<u>SERGEANTS</u>									
6. Davis, Burl C., 6948726	Oct 1/40	6					44.00		
Cl E Almt \$22.00 per mo fro Cl A Dep fr June 1/42 to Sept 30/42 incl									
8. Forney, George S., 7075842	June 3/40	3	44.00						
Cl F Almt \$22.00 per mo for Cl A Dep fr June 1/42 to continue indefinite									
10. Huddle, John T., 13003572	Jan 5/40	2				2.01			
Cl N Ded \$2.01 per mo fr July 1/42 to termination of war plus six months.									
<u>CORPORALS</u>									
13. Hargis, Edward R., 13003573	Jan 5/40	2				D- 2.10	10.00		
Cl E Alot \$10.00 per mo fr July 1/42 to termination of war plus six months. Cl D Ded \$2.10 per mo fr July 1/42 to termination of war plus six months.									
<u>PRIVATE FIRST CLASS</u>									
17. Fields, Terry C., 13004352	Aug 12/41	0					5.50 22.00		
Cl E Almt \$22.00 per mo for Cl A Dep fr June 1/42 to Sept 30/42 incl. Due US \$5.50 for Part Pmt on Cl E Almt not collected on prior roll.									
20. Hanuschak, Emil A., 13002156	Apr 12/40	2	5.50 22.00						
Cl F Ded \$22.00 per mo fr June 1/42 to cont indefinite. Due US \$5.50 for Part Pmt of Cl F Ded not collected on prior roll.									
<u>PRIVATE</u>									
24. Knox, James H., 6947172	Dec 12/40	1		18.75				1.50	
Cl A Pay Res \$18.75 per mo fr July 1/42.									
<u>NOT USED</u>									

WAR DEPARTMENT—Form No. 366a
 Form approved by Comptroller General U.S.—December 9, 1933

9-10948

Plate 18. Model Pay Roll.

not beyond the "Date of enlistment" column. As many lines as necessary may be used. These remarks should contain all data which may affect the soldier's pay and will be entered as provided for in "Model Remarks," Section II, AR 345-155. The use of figures for months, ditto marks, and the word ditto are prohibited. In all cases, in making entries the last name will be written first, e.g., "Doe, John H." and not "John H. Doe." (See Plate 18.)

Signing. When the pay roll has been made up, all men will be required to sign it. Signatures should correspond exactly with the names in the column "Names, present and absent, and grade," except that in signatures, last names will be written last, e.g., "John H. Doe." The original pay roll only is signed by the men of the organization.

Forwarding. When the pay rolls have been signed by the men and rechecked by the organization commander, the original and the first carbon copy are forwarded to the disbursing officer not later than the 25th day of the month. The second carbon copy is filed with the permanent records of the organization.

Payments. Payments are made to the enlisted men in cash at the pay table on pay day, which is usually on the first day of the month. This payment is made by the disbursing officer or, in many cases, by the company commander, who secures the money from the disbursing officer. At this time, all bills which are owed to the company by the enlisted men are collected. When the payment of the company is completed the organization commander signs the certificate on the pay rolls, acknowledging that he has witnessed the payment of all men paid and he then returns the pay rolls to the disbursing officer, together with the pay of any men who were not paid. Names of men not paid should be deleted by drawing a line through their names, marking each "not paid." These delineations must be initialed by the disbursing officer.

Military Correspondence. General. In military correspondence the same grammatical rules apply as those used in civilian communications. To write a letter clearly is not sufficient; it is essential that military correspondence be so worded as to obviate any possibility of its being misunderstood. Written correspondence should be limited and personal or local telephone conferences should be the rule. When letters are received they should, when practicable, be answered within twenty-four hours. Official correspondence with officers or individuals not in or under the War or Navy Department will conform to good civilian practice.

Channels of communication. The general rule is that, except as otherwise prescribed by the Secretary of War, communications, whether from a subordinate to a superior, or vice versa, will pass through intermediate commanders. This is known in the service as "going through channels." Thus a letter from Lieutenant Jones of Company A, 392d Infantry, to his regimental commander, requesting a leave of absence, would first go to the commanding officer of Company A, 392d Infantry, then to the battalion commander, and finally to the regimental commander.

Form necessary. In the preparation of a military letter there are certain general principles which must be followed. The letter should adhere to the prescribed form; it should be addressed to the commanding officer concerned and not to an individual; it should deal only with one subject; black ink only should be used; all letters should be written on one side only of letter-size paper (8 x 10½ inches). Unused margins should conform to the following width:

Top margin, first page	1 inch
Top margin, second and succeeding pages	1-¼ inches
Left margin	1 inch
Right margin	¾ inch
Bottom margin	1 inch

Pages (if more than one) are numbered consecutively in a single series, midway in the lower margin and one-half inch from the bottom of the sheet.

Prescribed form. (1) **Heading.** Nothing will be written in the upper third of the first sheet of each letter except the heading, which consists of the following:

The designation of the headquarters
 The designation of the office
 The reference file number
 The post office address
 The date
 The subject
 To whom the letter is sent.

(2) *Body*. The body begins just below the upper third of the first sheet. In military correspondence salutations common in civilian communications are not used, as for example: "Dear Sir," "Very truly yours," "Respectfully," and similar salutations. When typewritten, the body of the letter is single spaced, with a double space between numbered paragraphs. If a letter has more than one paragraph each paragraph is numbered serially with arabic numerals.

(3) *Signature*. Following the body of the letter comes the ending which consists of the signature, and immediately below the signature appears the officer's name typed identically with the signature, followed by the rank and organization or branch. If the officer signing the letter is in command, the word "commanding" will appear after the rank and organization.

(4) *Indorsements*. In the military service when it is necessary to answer a letter, a new letter is not written, as in civilian correspondence, but the reply is placed on the original communication in the form of an "indorsement," thus making complete, in one letter, everything which has been written in regard to the contents of the basic communication. The width of the indorsement will be the same as that of the letter and will begin one-half inch below the lowest element of the next preceding matter on the same page.

(5) *Inclosures*. In the event that other communications or documents are inclosed with a letter, a notation to that effect is placed just below the body of the letter or indorsement and marked *Incl. 1*.

Example. An example of a military communication:

Company A 392d Infantry

Fort Benning, Georgia
 May 15, 1939.

Subject: Leave of absence.

To: Commanding Officer, 392d Infantry
 (Through Commanding Officer, 1st Battalion 392d Infantry)

1. Request that I be granted a leave of absence for ten days effective May 20, 1939.
2. My reason for this request is that I desire to attend to some business matters.
3. My address while on leave will be care of St. George Hotel, Chicago, Ill.

(Signed) Charles D. Green,
 CHARLES D. GREEN,
 Captain, 392d Infantry.

1st Ind.

201-Green, Charles D., Off.
 CTG-HB

Hq. 1st Bn 392d Inf., Fort Benning, Ga., May 16, 1939.—To Commanding Officer, 392d Infantry.

Approved,

(Signed) Charles T. Stone,
 CHARLES T. STONE,
 Lt. Col., 392d Infantry,
 Commanding.

Correspondence Book and Document File. *Correspondence book.* Military correspondence is recorded by an organization commander by using a correspondence book (W.D. A.G.O. Form No. 8) supplemented by a document file. The correspondence book, which is a part of the permanent file of an organization, consists of numbered pages, referred to as the "body," and an alphabetical index, referred to as the "index." Entries made in either the body or the index are made in ink or indelible pencil.

Entries. Entries are made in the body of the book of each communication respecting which a record in the company is necessary and for which no other method of recording or filing is prescribed. This entry consists of the subject, the name of writer, the place and date, the date of forwarding or receipt, the disposition of the original and the serial number. Serial numbers begin with No. 1 and subsequent entries are numbered in sequence. When there is represented in the document file copies of a document and notation of action taken on it, it is necessary only to enter, in the correspondence book, the serial number of the document and the abbreviation "Doc." However, when there is no document or copies thereof present in the correspondence file, entries in the body of the correspondence book should include the serial number and a brief statement of its contents.

Index. Each document recorded in the body of the correspondence book should be indexed alphabetically under its subject and when necessary, cross-indexed under the names of the writer and under the name of the person or office to which addressed. The index entries for a specific document should bear the same serial number as that given to the document.

Document file. The document file supplements the correspondence book and contains the original documents or communications when they are retained, and a legible copy of all letters, indorsements or telegrams originating in the office. Each item in the file is numbered serially, beginning with No. 1 and bears the same number as the item and index entries in the correspondence book. Documents are filed according to serial numbers and kept together in the field desk.

Inspections. In order to prevent the accumulation of unnecessary or obsolete "documents" in the document file, an inspection is made annually by the commanding officer of the post or station, or an officer designated by him, and all papers which have become obsolete or unnecessary are eliminated.

Recording eliminations. When documents are eliminated from the document file, the abbreviation "Doc" on the body of the correspondence book is lined out and the date of elimination and the initials of the inspecting officer are inserted.

Free Postage. *Penalty envelope.* In conducting official military correspondence it is not necessary to pay postage provided "penalty" envelopes or wrappers are used. A "penalty" envelope derives its name from the fact that there is printed in the upper right hand corner the words "Penalty for Private Use, \$300."

Use of penalty envelopes. The regulations provide that official communications and other mailable matter relating exclusively to the business of the United States, mailed by an officer of the army, will be transmitted free of postage in the domestic mails of the United States when inclosed in a "penalty" envelope or wrapper, and likewise to transmission free of postage in the mails, between places in any possessions of the United States, from one to another of such possessions, from the United States to such possessions, and from such possessions to the United States; also from the United States to Canada, Cuba, Mexico, Newfoundland, and the Republic of Panama. If an officer has no penalty envelope available he may write in the upper left hand corner of the envelope "Official Business" over the name of the department, bureau, or office including the name of the officer sending it, and in the upper right hand corner the words "Penalty for Private Use, \$300."

Recent legislation allows officers, enlisted men, nurses and others in the Army to send post free personal letters. Envelopes must contain the name and rank in the upper left corner, and in the upper right corner the word "Free" in *handwriting*.

Use of penalty envelope for replies. When writing relative to official business to a person not in the military service, a properly addressed penalty envelope may be inclosed to cover the reply, when reply appears necessary, but penalty envelopes will not

be furnished to merchants or other dealers to cover the transmission of public property or the return of official vouchers, nor to a contractor or bidder to be used to send in the mails, free of postage, proposals or other matter concerning the business of the contractor or bidder with the government.

Packages. Packages of official matter including articles of public property, which are not greater in size than 84 inches in length and girth combined, may be sent through the mails subject to certain restrictions.

Air mail, special delivery, and registration. The prescribed air mail postage must be paid on all official mail intended for dispatch by airplane service.

Official mail which is of such character as to require the more expeditious delivery thus afforded will be sent "Special Delivery"; however, postage stamps to cover special delivery must be affixed, as is required for nonofficial mail.

When it is desired to register an official communication, stamps must be added covering the registration.

Stamps for special delivery and registration are secured from the quartermaster.

Company Orders. Preparation. Company orders are issued by the company commander and contain information which is deemed of sufficient importance to be published in formal written form to the entire personnel of the company. They are means by which a company commander records administrative matters and promulgates them to his organization. Such orders are also the means of announcing appointments, promotions and reductions made by the authority of the company commander. It is customary to number orders of this type serially within each calendar year.

Form. The usual form for a company order is shown on the following page.

Company A, 392d Infantry

Fort Benning, Ga.

December 16, 1940

Order
No. 8

1. The following appointment is announced in this organization: *To be appointed private first class:* Private Henry C. Benning, No. 687549.

2. The following reduction is announced in this organization: *To be reduced to the grade of private:* Private first class Henry R. Burke, No. 699845.

(Signed) Harry H. Wilson,
HARRY H. WILSON,
Captain, 392d Infantry,
Commanding.

Copies to:

- 1 File
- 1 Personnel
- 1 Bulletin Board.

History of Service. Preparation. Army Regulations now require that each company commander maintain a history of services of his organization; this may be kept in any suitable book or other permanent form. This record is a brief chronological history of the company from its inception and contains information concerning the original organization of the unit, notations as to the sources from which the personnel was obtained. In the case of a newly organized reserve regiment a majority of the personnel would come from civil life. There also should be noted a record of the strength of the organization at all times, its different stations, its marches, campaigns, battles, and its losses in battle, its various commanding officers, together with members of the company who have distinguished themselves in action.

Use. It is the paramount duty of each company commander to weld his company into a body capable of being commanded and accustomed to his leadership. He should instill into his men loyalty, sentiment, enthusiasm without limit, esprit de corps. It will assist the company commander in accomplishing this mission if he uses the history of services as a basis for short talks, reminding the command of the history of their organization and the important engagements in which the unit has participated.

Diary. *Army regulations* require that troops engaged in actual or threatened hostilities, or engaged in maneuvers, maintain a diary. Such a record is kept by all combat units from the company up to the higher organizations. In the diary is entered a detailed contemporaneous account of just what the company does each day, usually entered hour by hour as the events occur. There are also entered other items of military interest, such as positions reached, prisoners captured, and the morale of the troops. In preparing a diary, three copies are made, two being forwarded to the next higher commander and one retained for the company file.

Use of Army Regulations. Index. In order to facilitate the finding of a desired regulation on any subject, the War Department has issued two army regulations: AR No. 1-5 consists of an alphabetical index, and AR No. 1-10 consists of a list of current army regulations by title arranged numerically according to the serial classification which has been adopted.

Orderly room file. In view of the fact that it will be necessary to consult Army Regulations, it is important that each organization commander maintain, in the Orderly Room, a complete file of the latest appropriate regulations. These regulations should be filed in a binder in numerical sequence, as determined by both the base and subnumbers. Army Regulations are altered from time to time by the issue of new regulations and by what are known as "changes." Changes should be filed and kept with, and immediately preceding, the pamphlets to which they respectively pertain. It is good practice to mark, in red ink, that part of the regulation which has been changed, thus calling attention to the existence of the "change" next preceding. When new regulations are received they supersede all existing regulations of similar character on the subject, including any changes which may have been issued.

CHAPTER IX

MESS MANAGEMENT¹

Introduction. The subject of mess management is of particular importance to the medical officer. In the operation of a hospital the choice of diets and the skillful preparation of foods will be a matter of his daily concern in the treatment of patients. Officers assigned to duty with units of a medical regiment or separate battalion will operate messes for the feeding of their own men. The usual station hospital operates a mess for its assigned personnel as well as diet kitchens for patients. Financial and stock records must be accurately kept. Mess personnel must be trained, organized and supervised. It is a great truth that there is no single factor which is more important in the stimulation of morale than the serving at proper intervals of an adequate quantity of well-cooked food. Good food is the sum of good ingredients, good cooks, and good tools with which to work in its preparation. The officer who is assigned to duty which involves responsibility for a mess must be well instructed or his supervision will be of doubtful value.

Definition. Mess management is the supervision and control exercised over every phase of the operation of an army mess. The term *mess* is applied to those army groups who, for convenience, sociability, or economy, eat together. As used herein the term *mess* applies to company, battery, troop, squadron, hospital and detachment messes. Mess supervision is a function of command and is exercised, in some degree, by all commanders over the messes within their respective organizations. Direct control is exercised by the mess officer, who is assisted by the mess sergeant, cooks, and other mess personnel. Within the company the mess officer may be either the commander himself or a company officer designated by him. The phases of operation involved are the preparation of menus; the procurement and storage of food; the preparation, cooking, and serving of food; the proper use of the mess equipment; the economical and efficient use of rations; sanitation; and mess accounting.

Object. The object of good mess management is to build and maintain an efficient, economical, and attractive mess. Nothing contributes more to the morale of an organization than the fulfillment of this mission. *A good mess is the sum of good food ingredients, good cooks, good tools with which to work, and painstaking supervision.* It is not necessary for a mess officer to be an expert in cooking and nutrition to accomplish this task. He needs only to apply fundamental principles and check the operation daily to see that a variety of good food, balanced and properly cooked, is sanitarily served, without waste, in an attractive manner.

Organization of the Mess. The company commander is solely responsible for the mess. It is his duty to make certain that the mess is operated efficiently and economically, and that ample food of high quality is provided for the members of his company as regular procedure. In view of his many other responsibilities, he should appoint one of the lieutenants of the company as mess officer, thus giving the details of mess operation a closer supervision than would otherwise be possible.

The *mess officer* has entire charge of the mess. He should inspect, in company with the mess sergeant, the kitchen, the mess hall, the storeroom, and the personnel daily. He should check the menus to make certain that a balanced diet will be prepared. He should check the bookkeeping and inventory records frequently and thoroughly so that an accurate financial statement of the mess can be produced at any time. He should observe the preparation of the food to make certain that it is being well cooked. He should be present each day during the serving of at least one meal. A check list for a thorough inspection is shown herein.

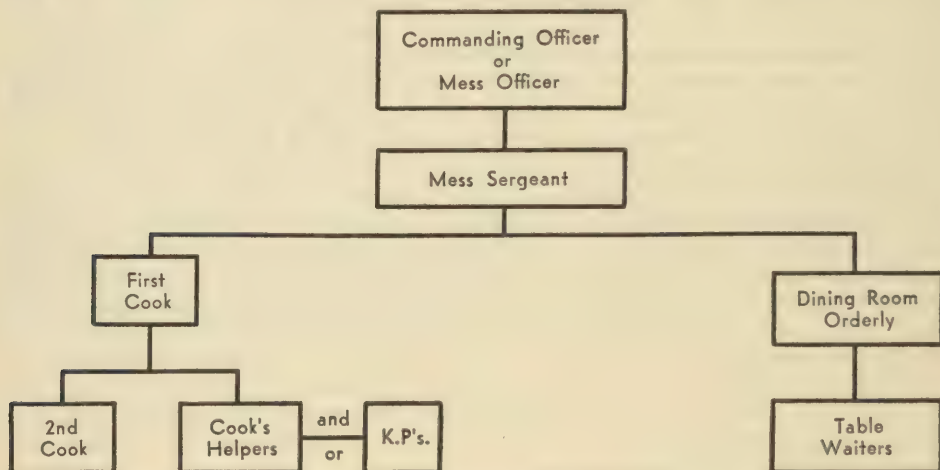
The *mess sergeant* is one of the most important men in the company; he is one of the key men in the organization. He is in personal charge of everything that goes on in the mess. He has charge of the purchasing and the drawing of rations. He keeps all the

¹ An extremely helpful book on mess management is *Army Food and Messing—A Manual of Mess Management*, The Military Service Publishing Company, Harrisburg, Pa.

accounts; supervises the preparation and serving of the food; is responsible for all the kitchen equipment and its sanitation, and for the cleanliness of all the personnel and the equipment, and is in charge of the training of the cooks.

The *cooks*, under the supervision of the mess sergeant, prepare and serve the food. They supervise and direct the work of the kitchen police. In the absence of the mess sergeant, the first-cook on duty is in charge of the kitchen. In every mess there should be several student cooks undergoing training.

The *dining room orderly* is in charge of the mess hall and pantry and is responsible for their cleanliness. He is charged with the cutting and the serving of the bread. He also sees that any breakage of dishes is reported so that the person responsible may be charged therefor.



Organization of the Mess.

The *kitchen police* are usually detailed daily from the company or members of the mess. In a mess of one hundred it will usually take three men to do the work required. The kitchen police work under the orders of the mess sergeant or the head cook. They police up the kitchen and dining room, wash the dishes, scrub the floors and cooking utensils, and perform such other duties which the cook in charge may direct. In tactical units under field conditions, cook's helpers may be required to perform the usual duties of kitchen police.

Inspection of the Mess. Organization commanders, mess officers, and other officers have frequent occasion to inspect the unit mess. These check-ups are useful and informative provided they are conducted by officers who know "where to look and what to look for." A casual inspection by an officer who fails to discover things which are badly managed or wrong entirely will encourage sloth; the mess personnel will know the things which are not up to standard, and if the inspector fails to note them harm, rather than good, may be the result. When an inspection is made, take time to do it well. The check list below is useful. Reference should be made to *Bulletin 27, The Soldier's Mess*; TM 2100-152, *The Army Cook*; and to TM 10-205, *Mess Management*.

1. *Bulletin board*: Check the food handlers' certificates.

2. *Mess accounts*:

Add sales slips to check column 11, (See Plate 1, QMC Form No. 469).

Check arithmetic of the form.

Every 10 days:

Check column 2 against morning report.

Inventory; investigate any discrepancy.

3. *Menu*:

Posted near cook.

Foods listed being served?

Time of preparation.

4. *Serving of meals:*

Hot foods hot; cold foods cold.

Serving system carried out?

5. *Uniform and cleanliness of mess personnel.*

6. *Kitchen equipment and special points to observe:*

a. Cooking ranges.

b. Baking ovens.

c. Fryolator; any grease on inside?

d. Steam cookers; any food stains on inside?

e. Coffee percolators; any coffee stains on inside?

f. Mixer; any food particles on inside or on attachments?

g. Meat block.

h. Pots and pans; examine edges and corners carefully.

i. Utensils; examine handles carefully and test cutting edges.

j. Refrigerator room; temperature (40°—50° F.).

k. Ice-cube freezer.

l. Storeroom and bread box.

m. GI cans for bulk foods; lids should fit tightly.

n. Sinks and dish washers.

o. Potato peeler; any potato fragments on inside?

7. *Dining room equipment:*

a. Steam table; examine corners and shelves carefully.

b. Dishes and cafeteria trays; any grease film?

c. Glasses; hold to light to observe any spots.

d. Tables; any water streaks on top?

e. Silverware; any food particles or food stains?

8. *Floors:* Any grease spots?

9. *Garbage stand:*

Lids should fit tightly.

Any refuse on cans, stand, or ground in vicinity of stand?

10. *Weekly schedule of cleaning:*

On Saturdays make complete inspection; on other days make list of items you will inspect, always including inspection of mess accounts.

Training Mess Personnel. The operation of a company mess requires the services of men who are skilled in the art of cooking and mess management with special reference to the problems of an army mess. The cost of feeding a company of 200 men for one month approaches \$3000, a sum of sufficient size to indicate a need for care and skill in supervision. Mess personnel who are trained in the School for Bakers and Cooks are far better prepared for this task than men without that training. Preparation of food to satisfy the needs and preferences of a large number of healthy and (always) hungry young men is quite a different problem than cooking in a restaurant. The cry, "When do we eat?" rings out in camp more frequently and more soulfully than any other!

Organization commanders will serve their interests best by accepting with alacrity each opportunity to send a man for training to a School for Bakers and Cooks. Cooks sometimes submit to human frailties or become "temperamental"; a reserve of several trained cooks to step in on short notice is convenient. But there is a worthwhile caution: If you hope to receive good men back from the School for Bakers and Cooks, send them good men to train.

A Word for the Kitchen Police. Kitchen police are detailed as cook's helper's. Their various duties, most of them unpleasant, include scrubbing pots and pans, scrubbing floors, disposal of kitchen wastes, peeling potatoes, and similar tasks. The job starts very early in the morning and is not finished until well after the evening meal. It is unfortunate that all military personnel have not served, at some time or other, as kitchen police. Their tasks are very important!

If the job is made the stepping stone, when opportunity offers, for a real try-out as a cook, men may seek the assignment. Men who have been good kitchen police make fine cooks, providing they are good men to start with and receive adequate training.

Some commanders award "KP Duty" as punishment. This practice, it is urged, is unwise, destroys morale, and places such an unsavory reputation on the job that some men feel disgraced to execute it, even for a day. This is unfortunate. Since it is a necessary task, the standard of performance desired is the same as for other military duties. Good KP service can be made to pay fine dividends in improving the mess.

Food Functions. Food is the general term for what is eaten by man in order to sustain life. When all the foods required to furnish energy, build and repair the body, and keep the body in a state of health are provided in a correct proportion, the diet is said to be balanced. A *Balanced Diet Chart* is shown below.

BALANCED DIET CHART

<i>Food function</i>	<i>Class of foods</i>	<i>Foods used:</i>
Furnish energy	Carbohydrates	<ul style="list-style-type: none"> Sugars <ul style="list-style-type: none"> Sugars Sirups Molasses Starches <ul style="list-style-type: none"> Flour Breadstuffs Potatoes and other starchy vegetables Cereals
	Fats	Butter, lard, meat fats, oils
Build and repair the body..	Proteins	<ul style="list-style-type: none"> Lean meats Cereals Eggs Fish Milk and cheese Beans, peas
	Minerals	<ul style="list-style-type: none"> Leafy vegetables Fruits Whole grain cereals Milk
Protect health	Vitamins	<ul style="list-style-type: none"> Fresh milk and cheese Fresh fruits and vegetables, especially raw Canned tomatoes Butter Eggs Whole grain cereals Fresh meats, especially liver
	Bulk	<ul style="list-style-type: none"> Leafy vegetables Fruits Whole grain cereals

The body performs its functions best when the prepared foods are consumed in definite ratio to each other, the total amount of each varying according to the type of work

being performed. Computation is quite involved for the determination of the exact quantities of each kind of food required for different types of work. Insofar as the army is concerned in time of war or mobilization, this problem has been solved by the adoption of the field ration, which provides a reasonably well-balanced diet, assuming that it is properly issued, handled, and used. The prescribed ration components may be departed from in time of peace.

A reasonably well-balanced diet may be obtained by serving meals during a day or over a period of days which:

(1) Include foods from each class—carbohydrates, proteins, vitamins, fats, minerals, and bulk.

(2) Have variety—different meats, different vegetables, salads, and desserts.

(3) Include vitamins and bulk foods—especially vegetables, fruits, and milk. These should be served daily if possible.

In determining whether a menu provides sufficient food of the proper type, the first point to consider is the nature of the duties performed by the individuals in question. A soldier in combat or at drill or fatigue expends more energy and requires more food than a soldier performing clerical duties. Under some conditions, there may be danger of insufficient health-protecting foods being served, but more frequently this danger is not due to lack of health-protecting foods but rather to improper methods of *handling* and *cooking* which partially or completely destroys those elements present. There is small danger of not enough food being included in the menu of an Army mess under normal conditions.

RATIONS

Definition. A ration is the allowance of food provided by the government for soldiers, and other authorized personnel during active service, for the subsistence of one person for one day. Officers are not entitled to rations but may draw them when in the field. They must deduct the value thereof from their pay vouchers.

Kinds of Rations. There are several different kinds of rations, each made up for certain conditions of service. The more common ones are:

The garrison ration.

The field ration.

The travel ration.

The Filipino ration.

Garrison Ration. The garrison ration is that prescribed in time of peace for all persons entitled to a ration, except under specific conditions for which other rations are prescribed, and consists of the following:

Meat: Bacon; fresh beef; fresh pork; fresh chicken.

Eggs.

Dry vegetables and cereals: Beans; rice; rolled oats.

Fresh and canned vegetables: Beans, string and canned; canned corn; onions; canned peas; potatoes; canned tomatoes.

Fruit: Canned apples; jam or preserves; canned peaches; canned pineapple; canned prunes.

Beverages: Coffee, roasted or roasted and ground; cocoa; tea.

Milk, evaporated and fresh.

Lard; or lard substitute.

Butter; wheat flour; baking powder; macaroni; cheese; sugar; cinnamon; flavoring extract; black pepper; cucumber pickles; salt; syrup; vinegar.

The garrison ration is always issued in the form of a cash allowance, its value being computed monthly by the Quartermaster on the basis of the cost of specified amounts of the components of the ration. The use of the garrison ration is at present restricted to certain posts and installations. A more detailed presentation of the use of the garrison ration is included in the discussion of the "Garrison Ration System."

Types of Field Rations. Four types of field rations are prescribed for use under the different conditions of field service. These four different field rations are as given below:

a. Field ration A. This ration corresponds as nearly as practicable to the components or substitutes thereof of the garrison ration. This ration will be issued as often as circumstances permit. It is as good as the garrison ration and is used instead of the garrison ration primarily to simplify supply in the field and supply of large bodies of troops. When ration savings are suspended in time of peace during maneuvers, or when large bodies of troops are concentrated, the ration issued is practically field ration A.

b. Field ration B. This ration corresponds as nearly as practicable to field ration A, except that items if of a perishable nature are replaced by processed or canned products—*i. e.*, canned fruits in place of fresh fruit, etc.

c. Field ration C. Field ration C consists of previously cooked or prepared food, packed in hermetically sealed cans. There are 6 cans per ration, as follows: 3 cans containing a meat and vegetable component; 3 cans containing crackers, sugar, and soluble coffee. The meat and vegetable cans contain a mixture of meat and vegetables similar to that used in a good vegetable soup. This mixture is very palatable when eaten, either hot or cold. The contents of one can is as much as the average soldier can eat at one meal, and it provides an excellent balanced diet, except for the lack of "roughage." The crackers are saltless and slightly sweet. Packed in the same can with the crackers are two or three cubes of sugar and sufficient soluble coffee to make one canteen cup full of coffee. The coffee is soluble either in hot or cold water. Since the components of this ration are previously cooked and can be eaten cold as well as hot, this makes an excellent emergency ration.

d. Field ration D. This ration consists of three 4-ounce bars of concentrated chocolate, or other components furnished for emergency use.

A fifth field ration, *Field Ration K*, has been developed but is not yet generally prescribed. It comprises three different packaged meals, each providing two types of biscuit, a meat or cheese preparation, a beverage and a confection. All items are non-perishable and concentrated. No cooking or preparation whatever are required, though hot water may be desirable for the beverages. Mess kits are not needed. The gross weight, packed, of field ration K is two pounds, five ounces, at present. Packaging improvements promise to save about four ounces per ration. One K ration supplies over 3400 calories. This amount is considerably more than enough to meet the requirements of a man at a relatively sedentary occupation but is less than is needed by a mountain trooper working hard to establish a position. Ration K is well adapted to the varying requirements of men according to the type of work they are doing because the several components individually packaged in the meal packet need not all be eaten at the same time. In other words, two meal-packages can be readjusted by the soldier to cover three actual meals when he is quietly resting in shelter or he can be issued an additional package for hard marching. Waste should be cut to a minimum in this way. The U. S. Army field ration K is the nearest approach to the ideal basic combat ration.

Travel Ration. The travel ration is issued to troops, either in time of peace or war, who, while traveling, are separated from cooking facilities. It is usually issued in kind but the value of the coffee, milk, and sugar components may be issued as "liquid-coffee money" when it appears probable that hot water and utensils for making the beverage cannot be obtained en route.

THE GARRISON RATION SYSTEM

Use. The garrison ration system is authorized for the Army War College, the United States Military Academy, all general hospitals, station of the Army Air Forces, and such other stations not exceeding an enlisted strength of 2500 men as may be approved by Service Command Commanders. In addition, at stations operating on the field ration system, the *garrison ration system* will be employed at station hospitals for patients. The fact that the garrison ration is prescribed at all general hospitals, and for patients at station hospitals makes it imperative that all officers of the Medical Department be familiar with the basic procedures employed in connection with this ration.

Operation. In the operation of a mess, either hospital or organizational, the mess is entitled to one ration per day for every person assigned to it for rations by proper author-

ity. The post quartermaster is charged with the supply of subsistence stores. He maintains a sales commissary where subsistence stores may be purchased.

On the first day of the month the quartermaster computes the cost of the ration and announces the price to the command for the current month, together with a price list of all subsistence stores kept on sale. The mess or organization opens an account with the quartermaster and purchases on credit at convenient periods such stores as may be needed. Such articles as cannot be obtained from the quartermaster may be procured from other sources, usually from the local market. At the close of the month or other settlement period the mess officer submits a ration return to post headquarters for all the rations his mess has been entitled to during the month. This return, upon the approval of the commanding officer, is sent to the quartermaster, who credits the mess account with the money value of the total number of rations to which it is entitled, based upon the cost of the ration for the current month. A balance is then struck and a settlement of the account made. If the ration credit does not cover the account charged against the mess, the mess officer or the organization commander as the case may be, is responsible for the difference. If the mess credit is more than the charge account, the difference is paid in cash to the mess officer in the form of savings. These savings, known as "Ration Savings", are entered in the accounts of the organization and are maintained separate from other funds as they can only be spent for food or beverages.

The Procurement of Food and Preparation of Menus. The procurement of food and preparation of menus are interdependent. Each operation requires advance planning and a careful consideration of the other in order to effect economy, variety, and satisfaction in mess operation.

In peace time a careful study should be made of the commissary price list and of local market conditions. Fresh milk, fruits, vegetables, fish, and similar articles are usually procurable, at attractive prices, to supplement or replace components of the garrison ration. Menus should be prepared at least a week in advance and arrangements made for delivery of perishable stores on the day required when possible. The purchase of excessively large stocks of food should be avoided, especially the purchase of large quantities of those foods which spoil readily. With a knowledge of what foods are available, menus can be prepared well in advance to provide for variety and a balanced diet. Numerous sample menus for various periods have been prepared and are readily available to the beginner as aids and guides. In general, the various meals should include the following when possible:

Breakfast—fresh fruit, a cereal, meat or a meat substitute, a vegetable, bread in two forms, butter and coffee.

Dinner—soups; meat, poultry, or fish; at least two vegetables, one leafy and one root; a salad; bread; dessert; and a beverage.

Supper—a little meat, a vegetable, plenty of bread and butter, a bit of sweet, and tea.

Drawing rations. In order to determine just what articles of the ration it may be necessary to draw on any given day, one must consider the menus to be prepared from the rations drawn and the ration stock on hand in the kitchen storeroom. The frequency of drawing rations (other than fresh meat and bread) is governed by local regulations. At some posts "dry" rations (*i.e.*, canned goods, flour, meal, etc.) are drawn weekly or semi-weekly. At other posts they may be drawn daily or as needed. Bread should be drawn daily from the post bakery (if established) or from the commissary, in order that it may be served fresh. Fresh meat also should be drawn on the day it is to be served.

There is no prescribed War Department form for requisitioning rations for a company mess. Each post prescribes the form (if any) to be used. It should be made out and submitted in duplicate, one copy being returned to the organization for check of the articles received. It should be required that the form be signed by the mess sergeant and approved by the mess officer. When the rations are drawn the mess sergeant, or the first cook on duty in his absence, receipts for the articles actually issued. One copy of this receipt is delivered to the mess officer for his use in checking the mess accounts on the WD, QMC Form No. 469.

Purchase from outside sources. All component articles of the ration and sales articles

WAR DEPARTMENT
M. C. FORM NO. 1008
REVISED 1915

MONTHLY MESS ACCOUNT OF Company D. 8th Infantry MONTH January YEAR 1916

Value of Ration, \$.4126 Allowance from Company Fund for Month, \$ None, for Day, \$ None Value of Stock at End of Previous Month, \$ 188.98

Day	1		2	3	4	5	6	7	8		9		10		11	12	13	14	15	16
	NUMBER MEN RATIONED	Value of Ration for the Day	Total Allowance from Company Fund	DA's Income from Ration or Other Sources	Total Credit for Day (3+4+5)	Total Owed to DATE	PURCHASES FROM COMMISSARIAT		PURCHASES FROM POST EXCHANGE		PURCHASES FROM OTHER SOURCES		TOTAL PURCHASES FOR DAY (8+9+10)		Total Purchases for Month	Total Purchases for Date	Savings from Q. M. for Day (3-8)	DEBIT from Q. M. for Day (8-3)	STANDING with Q. M. day-to-day previous day	STANDING For Month (7-12)
1	118	118	49.87	None	49.87	49.87	93.50	43.00	None	None	4.48	4.48	97.98	97.98	52.163	150.61	+	4.94	-49.4	-49.4
2	118	236	49.87		49.87	99.74	5.173	145.33			90	90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
3	117	353	49.44		49.44	149.18		145.33			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
4	116	469	49.02		49.02	198.20	78.81	224.04			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
5	116	585	49.02		49.02	247.22	72.37	296.41			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
6	119	704	50.02		50.02	297.24	71.17	368.58			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
7	116	827	49.44		49.44	346.68	46.27	412.95			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
8	117	937	49.44		49.44	396.12	1.18	418.03			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
9	119	1056	50.29		50.29	446.41	10.448	520.51			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
10	120	1176	50.71		50.71	507.12	1.18	521.71			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
11	120	1296	50.71		50.71	557.83	1.18	521.71			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
12	119	1415	50.29		50.29	608.12	52.37	660.49			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
13	119	1534	50.29		50.29	658.41	68.86	727.27			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
14	120	1654	50.71		50.71	709.12	35.71	744.83			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
15	122	1776	51.56		51.56	760.68	35.71	796.39			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
16	125	1901	52.82		52.82	813.50	35.71	849.21			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
17	125	2029	52.82		52.82	866.32	35.71	902.03			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
18	125	2154	52.82		52.82	919.14	35.71	954.85			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
19	125	2280	52.82		52.82	971.96	35.71	1010.67			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
20	125	2406	52.82		52.82	1024.78	35.71	1060.49			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
21	123	2531	56.21		56.21	1081.00	35.71	1116.71			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
22	123	2657	56.21		56.21	1137.21	35.71	1172.92			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
23	123	2784	56.21		56.21	1193.42	35.71	1229.13			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
24	123	2910	56.21		56.21	1249.63	35.71	1285.34			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
25	123	3036	56.21		56.21	1305.84	35.71	1341.55			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
26	123	3162	56.21		56.21	1362.05	35.71	1397.76			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
27	123	3288	56.21		56.21	1418.26	35.71	1453.97			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
28	123	3414	56.21		56.21	1474.47	35.71	1510.18			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
29	123	3540	56.21		56.21	1530.68	35.71	1566.39			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
30	123	3666	56.21		56.21	1586.89	35.71	1622.60			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69
31	123	3792	56.21		56.21	1643.10	35.71	1678.81			4.90	4.90	52.163	150.61	52.163	150.61	49.14	2.17	-49.4	-51.69

Value of stock on hand at end of present month, . . \$ 166.66
 Value of stock on hand at end of previous month, . . \$ 188.98
 Decrease-in value of stock, \$ 22.32
 Standing of mess on last day of month, \$ + 14.84
 Loss-in mess for month, \$ 7.48

I certify that the above is correct.
George W. Jones Mess Sergeant.
 Audited: Arthur B. Briggs 2nd Lt. 8th Inf.
 Officer in Charge of Mess.

STOCK RECORD

		10th Day						20th Day						Last Day					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ARTICLES	UNIT	BAL. FWD	REC'D	TOTAL ACCT 3-4-5	USED	BAL. OF HAND 6-8	VALUE OF 7	BAL. FWD	REC'D	TOTAL ACCT 9-10-11	USED	BAL. OF HAND 12-13-14	VALUE OF 14	BAL. FWD	REC'D	TOTAL ACCT 15-16-17	USED	BAL. OF HAND 18-19-20	VALUE OF 20
Apples, <i>consumption</i> #10	Can	4	12	16	15	1	24	1	0	1	0	1	24	1	12	13	13	0	—
Baking powder	Can	8	24	32	7	25	250	25	0	25	12	13	136	13	—	13	10	3	30
Beans, <i>can</i>	Can	10	31	41	42	—	—	—	108	120	74	26	416	26	52	78	78	0	—
Beans, <i>can</i>	Can	60	—	50	25	25	100	25	0	25	0	25	100	25	100	181	93	30	120
Beans, <i>stringless</i> #2	Can	18	48	66	18	48	330	48	—	48	42	6	42	6	12	18	15	3	21
Beans, <i>lima, dry</i>	Can	30	100	130	30	100	600	100	—	100	0	100	600	100	—	100	70	30	180
Beans, <i>lima, Red Kidney</i> #2	Can	39	—	39	1	38	228	38	—	38	—	38	228	38	—	38	—	—	—
Beef, <i>fresh</i>	Lbs	0	157	157	137	20	368	20	277	297	210	77	3363	77	222	297	297	0	—
Beef, <i>corned</i> #1	Lbs	0	00	00	50	50	100	50	0	50	50	—	—	—	100	100	100	—	—
Bread, <i>soft</i>	Lbs	0	308	308	308	8	24	8	308	323	273	40	150	40	273	323	607	15	43
Butter	Lbs	0	90	90	60	30	900	30	30	60	41	19	470	19	120	169	169	20	600
Cabbage, <i>Fresh</i>	Lbs	0	100	100	50	50	40	50	—	50	—	50	40	50	100	140	140	0	—
Chocolate, <i>plain</i>	Pkg	2	0	2	0	2	14	2	0	2	2	2	14	2	0	2	0	2	14
Cinnamon, <i>ground</i>	Can	25	0	25	2	23	4	2	4	—	4	—	4	2	—	4	—	2	24
Cloves, <i>ground</i>	Can	15	0	15	8	7	42	7	—	7	—	7	42	7	—	7	—	2	40
Cocoa, <i>br</i>	Can	3	0	3	2	1	39	1	—	1	—	1	39	1	—	1	—	1	39
Coffee, <i>instant or green</i>	Lbs	25	100	125	100	25	225	25	0	25	25	50	450	50	100	300	140	60	500
Corn, <i>Sweet #2</i>	Can	9	90	105	63	42	252	42	—	42	21	21	324	21	48	63	7	72	
Corn, <i>Blue Cerise</i> #1	Pkg	1	5	6	2	4	372	4	—	4	—	4	372	4	—	4	—	4	372
Corn, <i>meal</i>	Can	10	0	10	0	10	60	10	—	10	—	10	60	10	—	10	—	6	36
Cumulative Egg, <i>Can</i>	Pkg	30	120	150	150	0	0	—	120	120	60	60	3600	60	180	240	240	—	—
Eggs	Doz	30	120	150	150	0	0	—	120	120	60	60	3600	60	180	240	240	—	—
Flavoring extract, L.	Bts	9	0	9	7	8	346	8	—	8	—	8	346	8	—	8	—	8	346
Flavoring, extract, V.	Bts	1	2	3	2	1	41	1	1	2	2	—	—	—	5	5	3	2	82
Flour, <i>issue</i>	Lbs	100	176	276	271	25	50	25	276	379	276	25	50	25	379	477	37	100	200
Homemade, <i>Sabon #1</i>	Can	73	0	73	0	73	1606	73	—	73	—	73	1606	73	—	73	3	70	1500
Jam, <i>sour</i> , #10	Can	10	0	10	11	10	100	10	—	10	—	10	100	10	—	10	4	6	40
Lard, <i>issue</i>	Lbs	36	48	84	72	12	80	12	96	108	92	16	124	16	104	160	148	12	84
Milk, <i>evaporated</i>	Can	7	52	59	319	120	660	120	—	120	87	83	415	83	376	634	199	60	300
Molasses, <i>Can</i>	Can	2	6	8	2	8	4	2	11	13	8	5	215	5	12	17	17	—	—
Oats, <i>rolled</i>	Can	20	0	20	0	20	140	20	—	20	6	14	98	14	—	14	2	12	84
Oil, <i>olive, Sweet</i> #1	Bts	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oil, <i>cooking</i>	Bts	4	0	4	0	4	426	4	0	4	—	4	426	4	—	4	—	4	426
Oleomargarine	Lbs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onions, <i>fresh</i>	Lbs	24	200	224	176	50	100	50	—	50	—	50	100	50	—	50	—	50	100
Peas, <i>evaporated</i> , #10	Lbs	—	12	12	3	7	269	7	—	7	4	3	111	3	12	15	13	2	24
Peas, <i>Can</i> #2	Can	—	60	60	13	47	249	47	—	47	30	17	119	17	96	113	106	7	49
Peanut, <i>split</i>	Lbs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Pepper, <i>black</i>	Can	14	0	14	13	1	83	1	—	1	1	—	—	—	14	13	3	48	180
Pickles, <i>cucumber</i>	Gals	7	0	7	0	7	287	7	—	7	3	4	164	4	—	4	—	4	164
Pineapple, #10	Can	6	0	6	6	0	—	—	—	—	—	—	—	—	24	24	—	—	—
Potatoes, <i>fresh</i>	Lbs	500	600	1100	1000	0	—	—	1000	1000	300	700	700	700	1900	2600	1900	700	700
Prunes, #10	Lbs	15	0	15	4	11	374	11	—	11	—	11	374	11	—	11	2	9	306
Rice	Lbs	100	0	100	25	75	225	75	—	75	—	75	225	75	—	75	15	60	180
Rice, <i>Polished</i> , #10	Pkg	4	4	8	4	4	372	4	—	4	2	2	186	2	—	2	1	1	93
Salt, <i>can</i>	Can	5	140	145	85	60	60	60	—	60	10	50	50	50	—	50	10	40	40
Sauerkraut, #10	Can	11	0	11	4	7	147	7	—	7	6	1	21	1	—	1	—	1	21
Soup, #10	Can	5	6	11	4	10	320	10	—	10	0	5	160	5	9	14	9	5	160
Sugar, <i>granulated</i>	Lbs	200	400	600	300	300	1500	300	255	555	300	225	1125	225	400	625	300	320	1600
Sugar, <i>powdered</i>	Lbs	24	0	24	0	24	144	24	24	48	24	24	144	24	—	24	24	4	24
Tea, <i>black or green</i>	Lbs	6	0	6	1	5	205	5	—	5	—	5	205	5	—	5	—	5	205
Tomatoes, #10	Can	4	24	28	13	15	390	15	2	17	—	17	446	17	12	29	24	7	182
Vinegar	Gals	8	0	8	2	6	120	6	—	6	1	5	100	5	—	5	—	5	100
Yeast, <i>compressed</i>	Lbs	0	2	2	2	0	—	—	4	4	3	1	13	1	5	6	5	1	13

ADDITIONAL ARTICLES NOT LISTED ABOVE WILL BE ENTERED BELOW

Potatoes, Sweet #10	Can	6	6	12	9	3	81	3	0	3	-	3	81	3	6	9	9	-	-
Onion, Sweet	Can	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Mustard gal	Can	2	0	2	1	1	50	1	0	1	0	1	50	1	-	1	1/2	1/2	25
Mustard gal	Can	2	0	2	0	2	28	2	0	2	-	2	28	2	-	2	-	2	28
Mustard	Can	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Mustard	Can	50	0	50	25	25	125	25	-	25	-	25	125	25	100	125	25	100	500
Corn of Wheat	Can	8	0	8	0	8	162	8	-	8	-	8	162	8	-	8	-	8	162
Corn, Starch	Can	1	48	49	4	45	180	45	-	45	11	34	136	34	-	34	12	22	88
Butter #10	Can	11	6	17	9	8	200	8	-	8	3	5	125	5	-	5	5	-	-
Margarine	Can	1	1	1	1	-	-	-	2	2	1	1	76	1	4	5	4	1	76
Butter #10	Can	2	12	14	0	14	322	14	-	14	5	9	207	9	-	9	-	9	207
Butter #10	Can	20	0	20	2	18	108	18	-	18	5	15	90	15	-	15	10	5	100
Butter #10	Can	6	0	6	6	-	-	-	2	2	-	2	60	2	6	8	4	4	120
Butter #10	Can	0	12	12	4	8	176	8	-	8	-	8	176	8	-	8	4	4	88
Cheddar, Sweet	Can	20	0	20	10	10	180	10	-	10	10	-	10	-	-	-	-	-	-
Cheddar, Sweet	Can	60	0	60	10	50	200	50	-	50	-	50	200	50	10	60	-	60	240
Cheddar, Sweet	Can	50	0	50	10	40	160	40	-	40	-	40	160	40	20	60	20	40	160
Cheddar, Sweet	Can	12	0	12	1	11	363	11	-	11	1	10	330	10	0	10	-	10	330
Cheddar, Sweet	Can	44	0	44	14	30	180	30	-	30	0	30	180	30	0	30	7	23	188
Cheddar, Sweet	Can	24	0	24	2	22	132	22	-	22	1	21	126	21	0	21	1	20	120
Cheddar, Sweet	Can	30	0	30	8	22	270	22	-	22	0	30	270	30	0	30	7	23	207
Cheddar, Sweet	Can	6	0	6	1	5	305	5	3	8	2	6	36	6	0	6	1	5	305
Cheddar, Sweet	Can	3	0	3	3	0	0	0	6	6	0	6	108	6	0	6	1	5	915
Cheddar, Sweet	Can	13	0	13	3	10	70	10	0	10	0	10	70	10	0	10	0	10	70
Cheddar, Sweet	Can	7	0	7	0	7	308	7	0	7	0	7	308	7	0	7	0	7	308
Cheddar, Sweet	Can	23	0	23	6	17	357	17	0	17	1	16	336	16	0	16	0	16	308

as published in commissary price lists must be drawn from the quartermaster commissary, when such articles are available. In most posts, however, there are a number of ration articles which are not ordinarily available to be drawn from the commissary, such as fresh fruits and vegetables, fresh milk, etc. These are classed as "exceptional articles," and authority is granted to purchase such items from the Post Exchange or from civilian dealers. Ordinarily a list of the "exceptional articles" which the commanding officer authorizes to be purchased from outside sources is published by post headquarters. If the commissary is temporarily out of other items which are ordinarily available, such other items may be purchased from outside sources on a certificate signed by the commissary officer that such items are not available for issue to the organization. In some posts it is required that all exceptional articles which are purchased from outside sources must first be delivered to the commissary for inspection, after which, if they are found satisfactory, they are delivered to the mess which ordered them. This procedure, however, is not required at all posts.

Monthly mess account. The monthly mess account is maintained on WD, QMC Form No. 469. The keeping of this form is not particularly difficult, the heading of each column explaining exactly what should be entered. The account must balance every day. At the end of the month the column headed "Standing with QM" should agree within a slight margin of error with the ration savings figures for the month.

Inventory of stock. On the back of the Form No. 469 is provided space for an inventory of the mess stock on hand. This inventory must be taken on the tenth, twentieth, and last day of the month by the mess officer, and it is a good practice to require him to place his initials on the form for each inventory. The total value of the inventory on the last day of the month must be transferred to the front of the form (lower left corner) so as to show at a glance the summary of the actual worth of the mess for the month.

WAR DEPARTMENT
Q. M. C. Form No. 460 (Old 72)
Revised May 11, 1928

Quartermaster's No. _____

Ration Return of Company "I", 17th Infantry

At Fort Leavenworth, Kansas, from August 1, 1942, to August 31, 1942

Net number of rations due (including rations for men messing separately), all additions and deductions for percentage computed

2464

Corrections for percentages (Pars. 11 AR 30-2210, and 44 a and b AR 345-400): Additions No. 38 Deductions No. _____

	GARRISON	FILIPINO	TRAVEL	FIELD
Rations Required:	No. <u>2355</u>	No. _____	No. _____	No. _____

I Certify that this Ration Return is correct.

James R. Reeves

JAMES R. REEVES,

Captain, 17th Infantry,

Commanding Company "I", 17th Infantry

Approved: By order of Colonel PENNY:

Albert K. Mainar

ALBERT K. MAINAR,

Captain, 17th Infantry,

Personnel

Adjutant.

(For preparation of this form see Par. 10 AR 30-2210).

U. S. GOVERNMENT PRINTING OFFICE

5-5081

Plate 3. Ration Return. W.D., Q.M.C. Form No. 460.

Ration return. At the end of the month, in order to obtain credit for the rations drawn and consumed during the month, and to get the money value of the rations computed for the men messing separately, the unit or detachment commander prepares a "Ration Return" (QMC Form No. 460), signs it, certifying to the correctness of the return, and forwards it to the next higher administrative headquarters for approval. After approval by the proper commanding officer, this return is forwarded to the quartermaster and becomes a voucher to his accounts to cover the payment of the ration money or the issue of rations to the organization.

The information upon which the ration return is prepared is obtained from the Morning Report (WD, AGO Form No. 1) of the organization.

Men messing separately. When troops are subsisted on the garrison ration the post commander may authorize a married man (by custom) to ration separately so that he

may obtain his meals at his home. There is no limit to the number or grade of the soldiers who may ration separately as long as the organization mess is not jeopardized. The commanding officer is authorized, if conditions so demand, to require all members of the organization to take their meals with their organization. However, when soldiers are authorized to mess separately they are paid the value of the garrison ration for the number of days in the month for which they rationed separately plus 10%.

MESS ACCOUNTING IN THE FIELD

When the Field Ration is Used. In time of war or national emergency when the garrison ration is not used, the field ration is prescribed. The components of the field ration will be as prescribed by the War Department. Also, during maneuvers in time of peace and when large bodies of troops are concentrated (whether actually engaged in maneuvers or in other training), ration savings *may* be suspended; the ration to be issued will be that prescribed by the commander of the troops concerned. While the ration issued under such circumstances may not be a true "field ration," the result is exactly the same, so far as the management of the mess is concerned. The menu is prescribed by higher headquarters, and no meal planning is required of the company mess personnel.

Field Rations C and D. In time of war, field rations C or D, and probably Field Ration K, will be issued only upon orders of the commander of the field forces. In time of peace, such of these types as are available may, for training purposes, be utilized when directed by proper authority. When deemed advisable, a combination of field rations C and D may constitute the field ration. This combination will normally consist of two cans of the meat and vegetable component, two cans of the crackers, sugar, and coffee, and two each of the 4-ounce bars of concentrated chocolate (or other emergency food concentrates).

Field Rations A or B. For the purpose of further discussion, it will be assumed that either field ration A or field ration B is prescribed for use. It will be assumed also that the troops are in camp or in cantonment. The operation of the mess and feeding of troops in combat or under simulated combat conditions is dependent entirely upon the tactical situation (real or assumed), and it is not the purpose of this chapter to discuss tactical operations.

Daily Strength Reports. When the troops are on a field ration *and the ration savings system is suspended*, the monthly "Ration Return" is no longer submitted. The number of rations to which the company is entitled depends entirely on the number of men actually messing with the organization. Each day a report is submitted to regimental headquarters showing the number of men messing with the organization the previous day—not the "Daily Average Strength" as figured under the ration savings system but the actual number of men for whom rations must be drawn. Since each man actually present must have rations there is no computation of fractions of a ration. Since, all men for duty with the company (including those attached, either for duty or for rations only) actually mess with the organization the report will show the actual strength of the company as of the previous midnight, less those sick in hospital or otherwise absent, plus any troops attached for rations to the reporting company. If the officers eat with their organizations, as is often the case, they must be included in the report. In camp or cantonment, these figures will ordinarily be obtained by the personnel adjutant from the morning reports of the various companies.

Drawing of Rations. The daily strength figures for each mess operated within the regiment are consolidated by the personnel officer in regimental headquarters and are turned over to the supply officer as his basis for drawing rations. The supply officer draws rations for the entire regiment in bulk, breaks them down into the proper quantities for each mess according to the strength reports delivered to him, and delivers the rations to the respective company kitchens.

Rations for Large Force. For any large force it is necessary, of course, to order the rations several days in advance of their actual delivery to the companies. The only basis for ordering is the consolidated strength reports from the different units. This

means that the rations needed for February 10, for example, must be ordered on February 6, and on the basis of the strength as of February 6. In other words, if the company is feeding 150 men on February 6, and that number is reported as the mess strength of the company, the rations for February 10 will be delivered on a basis of a strength of 150 men. It may happen that the strength on the date the rations are delivered will vary somewhat from the strength which has been reported and used as the basis for delivery of rations. Ordinarily this variation will be slight, and the ration is sufficient to take care of slight changes. If any radical change in the strength of any company occurs after the strength figures are turned over to the regimental supply officer, and before he makes delivery of the rations, it is the duty of the personnel officer to inform the supply officer in ample time so that necessary adjustment may be made in the delivery of the rations. Similarly, if the personnel officer knows of any change impending in the strength of any unit when the strength figures are reported to the supply officer, the personnel officer should advise the supply officer of the anticipated changes.

Menus When on the Field Ration. As stated above, when troops are on a field ration, menus are prepared in higher headquarters, and the ration articles delivered to the companies are those called for by the menu prescribed for that particular day. Whenever possible these menus are published to the companies in advance of the receipt of rations in order that the mess sergeants and cooks may know how it is expected that the ration articles delivered are to be utilized. It is important that the menus be followed in order that the best use may be made of the rations delivered. For example, if the menu calls for a breakfast of scrambled eggs and bacon, this dish should be served, inasmuch as the eggs and bacon delivered would probably be insufficient to allow the serving of fried eggs and bacon or to serve them in any way other than that prescribed in the menu. This system relieves the company commander and his mess personnel from any planning of meals and menus.

Outside Purchases for the Mess. When on a field ration, the purchase of ration articles from accumulated ration savings in the company fund is ordinarily prohibited. Except when under actual campaign conditions, however, regimental and higher commanders may authorize such purchases when deemed necessary or desirable. The company commander should never make such purchases without prior approval from the regimental commander. Inasmuch as there is little income for the ration savings of a company fund when on a field ration, if the use of the field ration is to continue for an extended period, the company commander should consider such purchases carefully, when authorized, and should conserve the ration savings so that, if possible, there will be some money left to start his mess again on a garrison ration when authorized.

Additional Issues. In the theatre of operations, outside the continental limits of the United States, when facilities are not available to make sales of these items to troops from sales commissaries, exchanges, or commercial sources, the commander of the field forces may authorize the issue of any of the following items as a part of the field ration, not to exceed the allowances per ration as shown.

Article	Quantity	Article	Quantity
Blade, safety, razor .....each	.275	Cigarettes .....each	20
Razor, safety .....do	.010	Tobacco, cigarette .....ounce	.05
Shaving cream, brushless .....ounce	.14	Tobacco, pipe .....do	.08
Brush, tooth .....each	.015	Tobacco, chewing .....do	.02
Powder, tooth .....ounce	.035	Papers, cigarette .....sheets	2.5
Soap, toilet .....do	.14	Matches, safety .....book	2
Candy, hard .....do	1	Gum, chewing .....stick	1

Mess Management on a Field Ration. The remarks in preceding paragraphs regarding the operation of a company mess are equally applicable to a mess when on a

field ration. The company commander is still charged with the supervision of his mess. The mess officer must be required to make his inspections and must see that the highest possible standards of cleanliness and sanitation are maintained. The mess sergeant must exercise careful supervision over the cooks to see that meals are properly prepared according to the menus and that no food is allowed to spoil or to be wasted. Since the rations are delivered daily, and only in sufficient quantity for the number of men to be fed, if food is improperly prepared or is allowed to spoil, there is no reserve to make up for the wastage, and some one must get along with that much less than was intended. It should be remembered, also, that when the field ration is used the troops are generally engaged in maneuvers and are really hungry when meal time arrives. Nothing can lower morale of a company quicker than to know that sufficient food is delivered to the kitchen and is then allowed to be spoiled or wasted through the carelessness, inefficiency, or neglect of the kitchen personnel.

THE FIELD RATIONS SYSTEM

General. An innovation in field ration regulations was given a field test effective May 1, 1941, which continued for several months. On October 1, 1941, several important changes in procedure were made, and the system continued in effect.

Several organizations and stations were made exempt from these provisions. These are: the Army War College, the Military Academy, all general hospitals, stations of the Army Air Forces, and such other stations not exceeding an enlisted strength of 2500 men as may be approved by Service Command commanders. Among the smaller stations which may be exempted are reception and induction stations where strengths fluctuate widely.

Sales Commissaries. Sales commissaries are established for sales to individuals, if authorized by the commanding officer, and to organizations operating on the garrison ration system. They are operated under AR 35-6660 and obtain all articles from field commissaries.

Field Commissaries. Field commissaries are established at all stations where the field ration is prescribed. They do not sell to individuals but will sell to organizations where no sales commissary is operated.

The primary function of field commissaries is the timely issue of field rations of the quality and in the quantity prescribed in the approved menus. When in the interest of economy, due to fluctuations in prices or nonavailability of supply at marketing centers or other purchasing agencies, it is considered desirable to make substitutions of items for those prescribed in the menu, sales officers or officers in charge of field commissaries and officers in charge of marketing centers are authorized to make such substitutions. When substitutions are contemplated at a marketing center the officer in charge will notify the officer in charge of the field commissary at the earliest possible date of the substitutions that will be made. The officer in charge of the field commissary is charged with the responsibility of notifying organization commanders that such substitutions in the menu will be made.

Ration Savings Revoked. Authorization for the payment of a two-cent saving on the number of field rations issued was revoked on February 4, 1942, by Circular 35.

Officers' Messes. When the commanding officer deems such action necessary in the interests of the service he may establish within his command an officers' mess. Each officers' mess will have a mess officer whose duties in general are the same as the mess officer of any other organization mess. Officers are charged for meals at rates established by the post or organization commander, which may include, in addition to the cost of their meals, an overhead charge for service and the wear and tear on fixtures and equipment. An officer generally will pay his mess bill to the mess officer not later than the 10th of the month following that in which the indebtedness was incurred.

Messing with units. When due to the exigencies of the service, it is desirable that officers mess with organizations, the number of such officers for whom the field rations are to be drawn will be reported on daily ration strength returns, and the field rations will be drawn for such officers. By consolidating reports received from subordinate

units each post, camp, or station will prepare a report in duplicate, listing by name the officers for whom the field rations were drawn, and the number of rations drawn for each officer.

Payment for Officers' Rations. Officers who utilize the field rations will pay for such rations on the regular monthly pay vouchers. In order that this may be accomplished it is required that on the last day of the month, or at the end of the period for which field rations are drawn, a report must be submitted to the station commander by each organization drawing field rations for officers, showing the names of officers for whom the field rations were drawn, the number of rations drawn for each officer and the amount due the United States from each officer. After consolidation by the station commander the report is transmitted to the disbursing officer who pays the officers concerned. For each of the officers concerned, the amount shown opposite the officer's name is entered on the individual pay voucher with the notation "Due U. S. for _____ field rations at _____ furnished during the month of _____." Deduction for such field rations will ordinarily be made on the pay voucher for the month following that for which the rations were drawn for the officers concerned, at the rate of \$0.60 per ration.

Differences in the New Field Rations System. The new field rations system differs from the field rations, as previously discussed, in the following respects:

Men messing separately. Under the new system those enlisted men who are authorized to mess separately continue to do so and draw their commuted rations exactly as under the garrison rations system—*i.e.*, such men draw the value of the garrison rations plus ten per cent.

Operation of the New System. In general the new field rations system is operated as follows:

Monthly menus. The basis of the field rations will be a monthly menu, prescribed for all stations within a service command, or separate monthly menus for each station, or for a group of stations within a service command, as may be determined by the service command commander. Menus will be so prepared as to indicate the components for each of the three daily meals; they also indicate the total quantity of each item required to feed the menus to one hundred men.

The local commissary sales officer will compute the value of the garrison ration each month in accordance with Army Regulations.

Based on current prices, a computation will be made of the cost of feeding the proposed menu to one hundred men for a month. If necessary, the menu will be adjusted by minor reductions or additions in items or quantities of items so that the cost of the items actually issued for that menu will be the money value of the garrison ration.

Basis of issue. The field ration will be issued on the basis of the daily ration strength prepared from data contained in the accounts of the Morning Report (W.D., A.G.O. Form No. 1). Entries in this form will be for complete rations; computations for fractions of a day and corresponding entries in the column headed "Correction for Percentage" will not be made. Those men shown present in the strength section will be considered to be present for rations. The number of officers messing with the unit will be entered in the column headed "Correction for Percentage," and will also be shown by name, grade, and organization under "Remarks" on the morning report.

Daily ration strength returns. A daily ration strength return is prepared by the personnel officer of the unit (separate battalion, regiment, or similar headquarters) from the information contained in the ration account section of the various morning reports submitted to that headquarters. This daily ration strength return is prepared in quadruplicate, and contains the following information: the total number of men authorized to mess with the organization, not including those authorized to mess separately; the total number of officers messing with units of the organization; and, the total number of rations authorized as shown in the column of the Morning Report headed "Net number of rations due organization." The original and two copies are forwarded (through division headquarters where appropriate) to station headquarters.

Issues of Rations. As a general rule, issues will be made on shipping ticket, pre-

pared in triplicate, but the use of tally-out or other improvised forms is authorized. Rations are ordinarily issued in bulk by the field commissary to the division quartermaster (or designated officer for units of a station complement) who breaks down the issues for the various organizations of the division in accordance with their respective strength returns. The rations are then issued (again in bulk) to the various organization supply officers who in turn make the actual issue to the companies on the basis of strength figures furnished by the personnel officer.

Enlisted Men Authorized to Mess Separately. Under the field ration system, when in garrison the commanding officer may authorize enlisted men to mess separately. When so authorized these men receive the value of the garrison ration, plus ten per cent. In order to make proper payment to such men, a Ration Return (QMC Form No. 460) is prepared by the personnel officer at the end of the month showing the total number of rations (including the ten per cent for all men of the organization who are entitled to separate rations. A list of the individual enlisted men, showing the amount of ration money due each man, must be furnished the custodian of the organizational fund.

The Ration Return is forwarded to the officer in charge of the field commissary, who prepares a ration and savings account, and forwards it for payment to the disbursing officer (finance officer); who then pays the entire amount for all men authorized to mess separately in the organization to the custodian of the organizational fund. The custodian of the organizational fund distributes the ration savings funds received for men messing separately to the proper organization commanders; and the enlisted men receive the money due them from their respective company commanders.

Hospital Rations. Patients in the station hospital will continue to be fed on the garrison ration increased by fifty per cent. Enlisted men assigned to and messed at the station hospital, and civilian employees entitled to rations who are not patients, will be issued the field rations in the manner outlined above. At the end of each month, or other ration period, the post surgeon will submit a ration return for the garrison rations for patients. The money value of such garrison rations (less the cost of food items purchased from the quartermaster commissary) will be paid to the custodian of the hospital fund. The post surgeon will prescribe the kind and quantity of food for patients; the purchase of such food items will be made from the commissary or other sources as deemed advisable by the surgeon. Food items received as field rations for enlisted men's mess at station hospital may be consolidated with food items purchased for patients in order to establish a central mess for both patients and nonpatients participating in the hospital mess.

INSPECTION AND STORAGE OF FOODS

Inspection of Food Products Upon Delivery. The mess sergeant, or a delegated representative, should receive, inspect, and properly store all food items received by the mess. Such items should be clean, sanitary, wholesome, in full weight and measure, and of the grade required. Food which is decomposed or rotten, insect infected, wormy, moldy, or musty does not have to be accepted and should be rejected. It is especially important to inspect for condition all highly perishable meats, fish, poultry, fresh milk, fresh fruits and vegetables, butter, eggs, and the like. Cereals should be free of insects and canned goods should include no swollen or leaky cans. The weight of wrappings and containers should be deducted. The government contracts for net weights.

Prior to delivery, all meat and meat products, milk and milk products, are thoroughly and scientifically inspected by a member of the Veterinary Corps in accordance with standards established by the Bureau of Animal Industries of the Department of Agriculture. It is not unknown, however, for "substitutions" to be made after a shipment has been approved. A qualified person should inspect upon delivery.

Foods are subject to deterioration. Canned goods may spoil while in government storage or transit. Eggs (especially fertile eggs) deteriorate rapidly in warm rooms. The senses of sight, smell, and taste usually are sufficient to detect any spoiled foods. In case of doubt, the questionable articles should be segregated until inspected by a medical officer or veterinarian.

Meats. One test for spoiled meat in the carcass is to thrust a knife blade through the

flesh until the point strikes the hip or shoulder joint. Withdraw the knife, and smell the point of the blade immediately. Putrefaction usually starts at the joint and produces a foul odor. If the meat is spoiled, the incision made by the knife blade will remain open and the blade is easily withdrawn. In any case of doubt the decision should be made by a qualified inspector.

Canned foods. Spoilage in canned foods usually is indicated by "swelled" (bulged) cans. The bulging may be at one or both ends. The exception to this is in starchy vegetables, such as corn, pumpkin, squash, sweet potatoes, etc., which often spoil without swelling the can. This type of spoilage is called "flat sours." On opening, a strong disagreeable odor is noticed. It is never safe to use food from swelled cans.

Storage of Foods. The proper storage of food products is important in the interests of economy and sanitation.

All foods spoil more rapidly in warm temperatures than in cold. This especially applies to highly perishable foods such as meats, fish, butter, eggs, and milk. Spoilage of most foods is hastened by dampness; foods keep best when dry and cold. The refrigerator should not be used as a storeroom; the purpose of refrigeration is to prevent spoilage for a short period of time and to chill certain foods to increase their palatability. Containers of hot foods should be cooled and all containers wiped off before being placed in the refrigerator. Flat, shallow containers are preferable to tall, unstable ones. Foods absorbing odors should be covered and kept away from those which give off odors. The arrangement within the refrigerator should permit free circulation of air around the stored food. Food should not be placed in the ice compartment. The refrigerator should be maintained with tightly fitted doors and be kept well drained, clean, and dry.

The food storeroom must be kept clean and sanitary and the stores therein inspected frequently for spoilage. Stored goods should be neatly arranged and readily accessible. It is advisable to keep goods up off the floor to avoid mold or rot. Dark corners and recesses should be examined frequently for roaches, ants, and vermin. These are attracted by dirt, crumbs, and scattered food scraps. Only food products should be kept in the food storage room; the storage there of kerosene, oily rags, paints, and varnish should be avoided. Coffee should be kept in tightly closed containers to retain its strength. Spoiled foods should be removed promptly from the storeroom and set apart from all other foods.

COOKING

General. Proper cooking renders food more palatable and digestible and destroys any disease germs or parasites which might be present in the food. The most important factors involved are proper cooking time, temperature, seasoning, and blending. The only accurate way to determine whether food is properly seasoned is to taste it. Cooking of foods should not be completed until just a few minutes before serving.

Meats. Meat is the most expensive component of the ration.

Beef is the most important food used in the Army mess. It is universally popular and forms the main dish of many meals.

The tender cuts of a beef carcass are:

- (a) the rib in the forequarter and
- (b) the loin in the hind quarter.

These are best cooked as steak, or oven-roasted by moderate dry heat in an uncovered roasting pan. A common error in cooking these cuts is long cooking at high temperature so that the meat becomes dry, hard, and unpalatable when served.

The less tender cuts of beef are:

- (a) chuck, neck, brisket, plate, and shank in the forequarters and
- (b) round, flank, and shank in the hind quarter.

These cuts are best cooked by a long slow roast at moderate temperature in moist heat, or by being made into stew, meat loaf, or hamburger.

Pork is usually tender but it must be thoroughly cooked to kill any trichinae that may be present. Ingestion of trichinae may result in serious illness or death. A temperature of 137° F. throughout the pork will kill all trichinae. A simple test is to see that the cooked pork is an even gray color throughout, with no pink showing.

Veal is usually best cooked by long, slow cooking in moist heat. In cooking lamb and mutton, the same principles apply as for beef. This is also true of poultry; young poultry is tender, old poultry is less tender.

Vegetables. The principal methods of cooking vegetables are boiling, steaming, baking, and frying. Boiling is the most common. As a general rule, all vegetables should be cooked only enough to make them tender. This applies especially to the green leafy vegetables, as cabbage, cauliflower and spinach. Overcooking is the common error in boiling and results in loss of color, flavor, vitamins, and food value. Canned vegetables have been sufficiently cooked during the canning process; all they require is a little heat and seasoning to make them palatable. Dry beans require long soaking and then cooking for a long time at a temperature below the boiling point. Dehydrated vegetables require an overnight soaking and about four hours' cooking below the boiling point.

Salads. Salads are easily prepared. The fundamental principles to be observed are that the salads must be served cold, should be well seasoned and attractively served. Salad combinations are unlimited; for example, various combinations of fruits, nuts, vegetables, poultry, meats, fish and eggs, may be used in different ways.

Pastry. Pie, cake, cookies, and rolls require a *higher heat* than do meats and vegetables and a *shorter cooking time* than meats. Care must be exercised not to scorch the outside before the inside is cooked.

Beverages. Coffee is the most commonly used of the prepared beverages. A few simple rules for its proper preparation are:

Use ground coffee only once.

Use fresh boiling water.

Prepare the coffee no earlier than fifteen minutes before serving.

Make only enough for one meal.

Keep the coffee pot scoured.

Field Cooking. The principles of cooking are the same for field as applied in garrison. The chief difference is in the equipment used. The gasoline-burning Field Range, Model 1937, has been designed to perform a wide range of cooking operations, using regular or treated gasoline as fuel. This range performs efficiently and permits a greater flexibility in the preparation of meals than the ranges formerly used. Meals may be cooked on the truck while the truck is halted or moving, or the range may be removed from the truck and installed on the ground. In the event that gasoline is not available, wood may be used for fuel without mechanical changes and without loss of efficiency.

It is, of course, necessary that menus in the field be somewhat simpler than those served in garrison; but it is never necessary to extend simplicity to the point that troops receive a monotonous diet with stew, fried bacon, boiled beans, etc., predominating. By use of the gasoline range, field range, or pack cooking outfits, meats can be roasted, steaked, fried, braised, or made into meat loaf, hash, chop suey, chile con carne, etc. Potatoes can be boiled, fried, mashed, lyonnaised, browned, French baked, cheesed, etc. Vegetables and fruits, fresh, canned, or dried, can be served singly or in combination. The field ration provides flour, baking powder, yeast, and other ingredients sufficient to make hot biscuits, rolls, muffins, hot cakes, eggless cake, pies, cobblers, and puddings. Lack of suitable equipment or ingredients should never be accepted as an excuse for not turning out these and many other palatable dishes.

When thermos cans are not available, a satisfactory fireless cooker can be improvised by using a milk can, or similar can, placed within a larger can or box, with hay or straw packed tightly between.

Preparation of Foods for Cooking. Scrupulous cleanliness is the first consideration in the preparation of foods. The clothing and person of the cook, the utensils, and the food itself should be in as clean condition as possible. Polluted foods or unsanitary conditions in the kitchen may easily become the source of much sickness. The food should be inspected and sorted and all decayed or unfit portions eliminated. Then the neces-

sary cleaning, trimming, cutting, soaking, or other operation preliminary to the actual cooking should take place.

Serving Food. The proper serving of food is an important element of good mess management.

It is of little use to exercise great care in selecting and cooking food if it is to be presented for consumption in an unattractive manner. A little forethought and ingenuity will lend appetizing appeal to the plainest foods and pay large dividends in morale. Food should be prepared at the proper time; those intended to be served hot should be actually hot and those intended to be cold should be cold; neither should be placed on the table too early. Serving dishes for hot foods should be kept warm. Cold foods should be amply chilled in advance. Roast meat should be sliced uniformly and the slices laid evenly and neatly on the platter. If gravy is spilled on the edges of the platter, or any serving dish, it should be wiped away. Soft foods such as mush, mashed potatoes, and turnips, should be neatly rounded off, not merely thrown into the dish. Pies and cakes should be neatly arranged on the serving dish without excess loose crumbs. Fresh fruits such as apples, oranges, pears, grapes and bananas, are much more palatable when served chilled. It is economical to halve oranges, apples, and pears before serving. This practice encourages consumption by adding appeal and prevents the carrying away of fruit uneaten. Large bunches of grapes should be cut into smaller ones. A little cracked ice added to butter, olives, radishes, green onions, celery, lettuce and sliced tomatoes, before they are sent to the tables makes these foods much more appetizing. One of the best ways to make food attractive is by garnishing. The effect of color contrast is very pleasing. Small quantities of many materials can be used for garnishing at nominal costs. Some of these are parsley, paprika, strips of pimento, green pepper, and bacon; slices of lemon, tomato, and hard boiled egg; a few french fried potatoes; small quantities of green lima beans, diced celery, small whole boiled onions, green peas, and cooked carrots; cocoanut; etc.

The mess halls should be clean and inviting. Good light and ventilation, painted walls, and clean windows hung with curtains, are all morale builders. Clean mess tables with an ample assortment of condiments and an orderly arrangement of thoroughly cleaned dishes and tableware are conducive to good appetites. Condiment containers should be kept well filled and clean. When table linen and chair covers are used they should be repaced and laundered frequently.

Serving in the Field. In the field food should be served systematically in order to expedite service while the food is hot, to avoid wastage, and to retain morale. Serving is facilitated by raising the containers off the ground to a convenient level. In general, foods should be served in the meat can, cover, and cup, in the following order: meat vegetables, salads, dessert, bread, butter or jam, and beverage. Food servers must be trained to estimate accurately the number of portions of a given size which may be served from the different sized kitchen containers. These food servers should avoid spilling food, filling mess kits over-full, and unnecessarily mixing food together in the mess kits. Portions issued for the first helping should be of moderate size. No man should be given a second helping until all have had a first helping. The serving line should be so laid that the men will naturally head away from the kitchen after being served, preferably in the direction of the water sterilizing bag or fresh water supply. A definite area should be assigned in which the food served is to be eaten in order to avoid food being taken into tents or unduly scattered. Either garbage cans, an incinerator, or pit must be provided for disposal of scraps of food. Three cans of boiling hot water, two soapy for washing and one clean for scalding and rinsing, should be provided. This latter makes it unnecessary to wipe the mess kit dry, as the moisture will soon run off and evaporate if the water is hot enough. These cans should be readily accessible and, if possible, should be alined over a fire to insure continuous high temperature of the water. When in close contact with the enemy the foregoing procedure must be modified to effect secrecy and security. The use of lights must be restricted and bunching must be avoided.

PRECAUTIONS DURING VERY COLD WEATHER

General. During an operation in snow and extreme cold, such as is likely to be encountered in many parts of the continental United States as well as the northern bases, special precautions with respect to messes must be observed. They include selection of the best food components, sanitary provisions, and a considerable element of foresight and thoughtfulness on the part of mess personnel. *Field Manual 31-15, Operations in Snow and Extreme Cold*, September 18, 1941, contains a complete discussion of the entire problem and includes information on the importance of food.

Importance of Certain Foods. Some foods produce more heat than others. Sugar and fat are high in heat-producing qualities. Consequently, the ration should include a greater proportion of these than is normally issued. The amount of food should also be increased. Corn bread is more heating than white bread.

Hot Foods. Whenever possible, food, tea, coffee, and soup should be served hot. It is better to serve each soldier with two helpings of hot food than to give him all of his food at once and allow it to chill before he can eat it.

Cold mess equipment soon chills food. At the kitchens, it is desirable to provide means for heating cups and mess pans. Cans of hot water may be provided into which soldiers may dip their mess equipment to heat it before food is placed on the containers.

Mess Sanitation. Low temperatures present more difficult problems of mess sanitation under field conditions. While it is always important that mess gear and kitchen utensils be thoroughly cleaned, it is more difficult to do so in low temperatures. Cold congeals grease quickly, and other materials tend to cling to the containers. Provision for an adequate quantity of boiling water presents its own problem. Regardless of the added difficulties, a high sanitary standard must be maintained, for mess gear which is not thoroughly clean may be the cause of diarrhea.

Foresight by Mess Officers. During periods of field service in low temperatures, mess officers must study their problems with special care and provide for the unusual requirements. After a period of exposure men are especially appreciative of a hot drink, and there is none so generally enjoyed by the American soldier as hot coffee. Often the serving of a hot drink should not await mealtime; this is especially true of night exercises, patrol duty, guard duty, and other missions which require exposure. Surprise your men with an unexpected hot drink when they finish a task or during the execution of a trying duty. Be certain that the hot food or drink is served *hot*, for luke-warm coffee or soup is insipid at best. Make use of the insulated hot food containers. The dividends which accrue within an organization which practices these small and thoughtful things are worth far more than the extra expense and effort.

HOSPITAL MESSES

Hospital messes are maintained for the medical department enlisted force on duty and for the patients in hospitals. An officer is usually detailed in charge of the mess, and a noncommissioned officer is appointed as mess sergeant to assist him. The mess officer is responsible for the management of the mess, the finances, and the accounts pertaining thereto. The personnel required to run hospital messes include cooks, assistant cooks and kitchen police. For large hospitals several types of kitchens are necessary, such as kitchens for the general mess, a special diet kitchen, and ward diet kitchens. Hospital messes are financed by funds received from the ration allowances of the enlisted personnel on duty and the patients sick in hospital plus monies received by the hospital fund. Hospitals usually maintain a separate mess for nurses.

Dieticians. The mess officer in many medical installations is assisted by a female dietician, who is a civilian employee, and who has received special training in army procedures in certain large Army hospitals. The dietician assists the mess officer in preparing balanced menus, and various diets. She advises the cooks concerning the proper preparation of foods for diets, and supervises the serving of food from diet kitchens.

Diets. The mess officer prepares daily menus and submits them to the commanding officer of the hospital for approval. The ward officers indicate on the daily diet slips the

diets required to meet the needs of their respective wards. Diets in hospitals are classified as regular (full), liquid, light, soft, and special.

Regular diets are the full diets intended for patients whose condition will permit the ingestion of a full, well-balanced meal. They should contain all the dietary requirements—calories (3000), carbohydrates, proteins, fats, minerals, vitamins, and bulk—to meet the needs of a normal, healthy soldier.

Liquid diets are intended for patients acutely sick, generally those running high temperature (hyperpyrexia) or suffering from dehydration. The liquid diet is given to increase the fluid intake and to reduce the task of digestion to a minimum. They usually contain about 1500 calories and are not suitable for use over a protracted period of time. Feeding is frequent, usually every three hours while the patient is awake. The following articles are considered suitable for liquid diet: soups (vegetable and cream), fruit juices, gruels (barley, cracker, oatmeal), bouillon, beef-tea, broths (beef, lamb, chicken, oyster), albumens (orange, lemon, or plain), egg-nogs, ice cream (plain), milk, buttermilk, milk-shakes, tea (hot or iced), coffee (hot or iced), and cocoa.

Light diets are intended for patients requiring fewer calories than those provided in the regular diet. As a step between the liquid and regular diets, they are easier to digest than the latter. Fried foods or food cooked in deep fat must not be served. Other foods not to be used are pies, pastries, hot breads, biscuits, hot cakes, and gas forming foods or vegetables difficult to digest such as cabbage, turnips, onions, cauliflower, Brussels sprouts, and broccoli. The following foods may be used as a basis in selecting the light diet:

Soups: broths, vegetable soups, or cream soups.

Meats: baked, broiled or creamed chicken; baked or broiled fish (meat substitute); roast lamb or broiled lamb chops; crisp bacon; creamed or stewed oysters; coddled, poached, soft boiled, or scrambled eggs (meat substitute).

Starchy dish: baked or mashed white potatoes, rice, grits (hominy).

Green vegetables: spinach, beets, sugar peas, squash, string beans, lettuce, celery, tomatoes, and carrots.

Salads: lettuce, celery, tomato, canned fresh fruit, and banana.

Bread: toasted, crisps, and crackers.

Desserts: fresh, ripe fruit; canned fruit; stewed fruit; custards, curded milks; or creams; ice cream; puddings; and simple cookies.

Beverages: tea, coffee, milk, buttermilk, cocoa, and chocolate and milk preparations.

Soft diets are used to span the few meals between the time when the patient's needs and appetite require more than a liquid diet but is as yet unable to take the more solid constituents of the light diet. Any foods included in the liquid diet may be given, but these may be supplemented by some easily digested foods in the semi-solid and solid forms: cereals such as cream of wheat, grits, oatmeal, and cooked wheat; mashed and baked potatoes; soft boiled, soft scrambled, or poached eggs; dry toast, milk toast, crackers, rye crisp; gelatins (plain); ice cream; baked or boiled custard; apple sauce; tapioca; baked apple (skin removed); milk or cream curds; and wholesome puddings.

Special diets are prepared upon order from the ward surgeon who prescribes each item of the diet and the amount of each item, except in large hospitals where prepared diet lists are maintained and the services of a dietician are available.

Patients who are able to attend the regular mess in the mess hall should do so, as the handling of trays for ambulatory patients is unnecessary work. Trays should be neatly prepared, hot foods served hot, and cold foods served cold. An attractive food tray stimulates the appetite of the patient. Serving an acutely sick patient an excess of food beyond his needs or desires is abhorrent to the patient and wasteful of food. The edible food waste should not exceed six ounces per person in a day. Limiting the food served to the actual requirements of the patients concerned will assist in lowering the portion of edible waste from the hospital mess.

Commutation of Ration Allowances for Patients in Hospitals. The ration of enlisted men, applicants for enlistment, prisoners, civilian employees of the Army entitled to rations, and discharged soldiers held in hospital for treatment, while patients in a hospital, is commuted at the following rates: (1) At establishments maintained for the treatment of tuberculosis patients or for tuberculosis patients in other hospitals, at the actual cost of

the ration, plus 90 per cent; (2) For all cases other than those of tuberculosis, at the actual cost of the ration, plus 50 per cent.

Hospital Mess Charges. (1) Officers at station hospitals, \$1; at general hospitals, not to exceed \$1.50; (2) Civilian employees and veterans' administration beneficiaries on the status of enlisted men are charged at the same rate as enlisted men plus 10 cents per day. Those on the status of officers are charged as for officers.

Mess Accounting. Daily transactions of the mess are accounted for on the mess account (Form 74 M. D.) which is kept by the mess sergeant. The daily balance thereon exhibits the financial status of the mess. Purchases are made by the mess sergeant under the direction of the mess officer and are paid for at the end of the month. Subsistence stores received and issued from the storeroom are carefully checked. A storeroom attendant keeps an inventory of the supplies on hand. Regulations require that a certain per cent of the ration allowance be spent at the commissary. Necessary articles of diet for the sick in hospital, however, may be purchased in the open market. The following are the essential precautions to be taken in the financial administration of the hospital mess.

1. The daily expenditures should not exceed the daily income except in so far as it is advisable to take advantage of market conditions to increase the inventory of the stock rooms.

2. Stock room supplies should not be allowed to fall unduly. Over issues therefrom are equivalent to over expenditures of cash funds.

3. Accurate check into and out of the storeroom.

4. All bills should be rendered monthly and no outstanding obligations permitted.

The Hospital Fund. A hospital fund is maintained in every hospital for the purpose of messing the hospital personnel and patients and providing authorized and legitimate recreation and entertainment.

The hospital fund is derived from: ration allowances of patients and enlisted force on duty; dividends from the post exchange; sales from post garden; money received for the subsistence of officers and civilians treated in hospitals; the sale of property purchased with the hospital fund or products pertaining to the hospital fund; and from nurses subsisted in a mess conducted by the commanding officer.

The hospital fund is kept by the surgeon or an officer detailed for this duty who is held responsible for the loss of any portion of the fund not deposited in the bank or in the hospital safe. Expenditures therefrom are limited to the purchase of food and other articles for the benefit of the patients and enlisted men on duty in the hospital. A financial statement of the hospital fund is prepared monthly and audited by the hospital council, the proceedings of which are recorded on the retained statement of the hospital fund (Form 49 M. D.). The hospital council consists of the three senior officers on duty at the hospital.

Durable property purchased by proper expenditures from the hospital fund is recorded and accounted for each month in the space provided therefor on the hospital fund statement.

CHAPTER X

SUPPLY

Introduction. The necessity for an adequate and dependable system of supply is very important in the Army, both under the conditions of active campaign and in garrison. During an operation in the field, the placing of essential supplies at the places needed, in sufficient quantity, and at the time required will have much to do with the success or failure of the commander's plan. The lack of adequate supplies at a crucial time may, indeed, change a victory into unavoidable defeat. In normal garrison service, or in the Zone of the Interior in time of war, the problem has the same degree of importance, although in the latter case failure may not have so immediate or disastrous consequences.

Supply is an important subject for the medical officer. His department is itself a supply service in that it secures and distributes medical supplies for the use of its own units and installations. It is concerned with the routine supply of its own units for the articles prescribed in Tables of Allowances, Tables of Basic Allowances, Tables of Organization, and other items which are necessary to satisfy special needs.

Necessarily, the system of supply which is prescribed for these divergent needs differs very widely. This chapter contains useful information on the subject, both in campaign and in garrison, with especial reference to the problems encountered by the leader of a small unit. The subject is presented under the following headings: Supply in the Field and in Combat, and Medical Property and Supplies. The subject of Supply and Evacuation of Large Units is presented in Chapter VI, Part I.¹ Problems of medical supply in combat are discussed in Chapters I, II, III, IV, and V, Part III.

Principles of Supply. There are five fundamental principles of supply as follows:

1. Combat troops must be furnished continuously with the proper kind and quantity of supplies.
2. Combat troops must not be encumbered with unnecessary supplies.
3. Supplies must be echeloned in depth.
4. The impetus of supply comes from the rear.
5. The organization for supply must be flexible, mobile, and simple.

Supply Personnel Within the Company. The supply sergeant of a company is responsible for checking and distributing supplies, except rations and water which is a responsibility of the mess sergeant, and for the supervision of men who may be assigned temporarily as his helpers. During combat the supply sergeant will usually be in the forward area in order to assist the company commander in matters relating to supply, particularly medical supply.

Supply Personnel of the Regiment. The regimental or (separate battalion) supply officer (S-4) supervises the regimental supply service and is responsible to the regimental commander for its functioning in accordance with the orders of higher headquarters and the tactical plan of the regiment. His duties require him to keep in close touch with S-3 and the tactical situation, with the service company, with subordinate commanders and the troops, with the division G-4, and with all supply installations.

S-4 is assisted by certain members of the supply section of the service company. These constitute the supply office group. S-4 supervises their training and operation.

The service company commander is the principal assistant of S-4 in the execution of the regimental supply plan, except for Class V supply. He commands the regimental train bivouac and operates from it. He is kept fully informed of supply plans and uses the personnel and facilities of the service company in their execution.

The duties of S-4 include planning for and supervising matters concerning the following:

- Procurement, storage, transportation and distribution of all supplies.
- Location of supply, medical, and maintenance installations.
- Maintenance of equipment.

¹ For a complete discussion of supply procedures in the Zone of the Interior, the reader is referred to *The Officers' Guide*, 9th Edition, Military Service Publishing Company.

Salvage (as directed by higher authority).

Collection and disposal of captured supplies.

Evacuation of personnel.

Traffic control (coordination with S-3 and headquarters commandant).

Recommendations concerning protection of the regimental train bivouac and other rear installations (coordination with S-3).

Property responsibility.

Preparation of administrative plans, paragraph 4 of written field orders, and fragmentary administrative orders.

Class I Supplies. The procedure for receiving and distributing Class I supplies is basically the same in all operations of a campaign.

Daily strength reports are submitted by the companies to battalions and forwarded to the regiment where they are consolidated and sent to the higher administrative unit. At each headquarters the S-4 concerned receives a copy pertaining to that unit. This daily strength report is the only requisition required for Class I supplies. Higher authority prescribes the hour and place where the regiment is to obtain its daily supply. Delivery may be made to the regiment's train bivouac, or at some other distributing point, and transported by regimental vehicles. Since delivery is made on the basis of strength reports previously submitted adjustments may be made in order to compensate for changes in strength. This is accomplished by the regimental supply service. In moving situations, supplies must not be permitted to accumulate beyond capacities of the regimental trains. Normally, the train carries one day's subsistence for men and animals; one *ration*. The kitchen carries one food ration. One additional ration can be carried on the unit train if necessary.

Distribution within the regiment begins on arrival of these supplies at the unit train bivouac. The rations received in bulk are sorted and apportioned to the unit kitchens. In motorized units, the kitchens are normally set up in the train bivouac. Combat conditions ordinarily prohibit daylight movement of vehicles in forward areas; hence the issue of food to troops during daylight is impracticable. Kitchens customarily prepare meals so that the forward movement for final distribution begins at dark. In motorized units, kitchen trucks loaded with food containers are normally grouped and moved under regimental control to the *regimental point of release*, which is a location convenient to all battalions and separate companies. There the trucks are released to those subordinate units at the hour previously specified. The trucks are advanced, under battalion control, to *battalion points of release*, and turned over to company representatives who guide them to *mess locations* as close to the troops as possible.

The company mess location should be as near the troops to be fed as tactical conditions permit. The location should afford concealment from hostile observation and should provide defilade from hostile flat-trajectory fires. The company commander selects the company mess location, and insures that the men of his company and those of any attached elements are fed. The feeding of personnel at detached posts must not be overlooked.

After the kitchen vehicles arrive at the company mess location, feeding of troops begins as soon as preparations are completed. If a majority of the men can be served at the mess location, this is the most satisfactory method of feeding. Care must be taken to prevent congestion at the mess. Dispersion may be secured by serving the meal by squad, and requiring that squads remain separated by safe distances while at or near the mess location. Food and water in containers may be transported by carrying parties to those men who cannot come to the mess.

In some instances elements of the company will be employed at a considerable distance from the mess. It may be practicable to deliver food and water containers to these elements by use of a company vehicle, such as a weapon carrier; or platoons or sections may be attached to nearby companies. When expedient, kitchen transportation of companies adjacent to heavy weapons elements may deliver and return food and water containers of these elements. In any event, it is incumbent upon the commander of the heavy weapons company to make timely recommendations to the battalion commander of a plan for distribution of rations which will insure that his men are fed.

Platoon leaders, after being informed of the time, place, and method to be used for the distribution of the meal, are responsible for having carrying parties, or organic platoon transportation, present at the company mess location when the kitchen vehicles arrive. Each carrying party, or the driver of the platoon vehicle, is informed as to the latest hour at which the empty containers must be returned to the company mess location.

Filled water containers are sent forward with meals. Canteens are refilled at the company mess location. This is expedited by emptying containers into sterilizing bags having multiple outlets from which the canteens may be refilled. When men are unable to come to the mess location, their canteens may be brought to the mess location by others and refilled, or water may be transported to them in water containers by carrying parties or company vehicles. Water is replenished locally wherever practicable. Before use, however, this water must be tested, purified if necessary, and its use approved by appropriate medical personnel.

Class II Supply. General. Class II supplies comprise articles for which allowances are established by Tables of Basic Allowances. Type items are clothing, gas masks, arms, trucks, and items of signal equipment.

Replacement. Clothing and individual equipment are ordinarily replaced during periods when the company is not engaged in combat.

When weapons or prescribed items of individual or organizational equipment are required during combat to replace those which have been damaged, destroyed, or lost, the company sends its requests through command channels to the regiment. Small amounts are usually involved, and delivery is made through the same channels as for class I supplies.

The company sends back damaged weapons and equipment to the train bivouac by kitchen vehicle or other transport going to the rear. The supply sergeant arranges with the supply office group (S-4 section) of the service company to turn in and secure replacement for articles damaged beyond local repair.

Class III Supply. General. Class III supplies for the company consist of gasoline, lubricating oil, and grease. The regiment carries a reserve of gasoline and oil in containers. A part of this reserve may be distributed to individual vehicles. These containers and the fuel tanks of vehicles are refilled at every opportunity.

Distribution. During movement or in combat, the regiment and higher headquarters will establish class III distributing points for the resupply of motor fuel. At such points resupply may be effected by exchanging empty for filled containers or by the direct filling of vehicle tanks from multiple-outlet trucks.

Individual vehicles sent to rear area supply establishments are serviced with gasoline and oil at these points. Other vehicles are resupplied at or from the regimental gas and oil distributing point which is established in the regimental train bivouac or other suitable location. To facilitate supply, small stocks of class III supplies may be established at the battalion ammunition distributing point, or filled containers may be delivered with class I supplies to the company area.

Class IV Supply. General. Class IV supplies comprise articles which are not covered in Tables of Basic Allowances and the demands for which are directly related to the operations contemplated or in progress, except articles in class III and class V. Engineer field fortification materials are the principal class IV items of concern to the company.

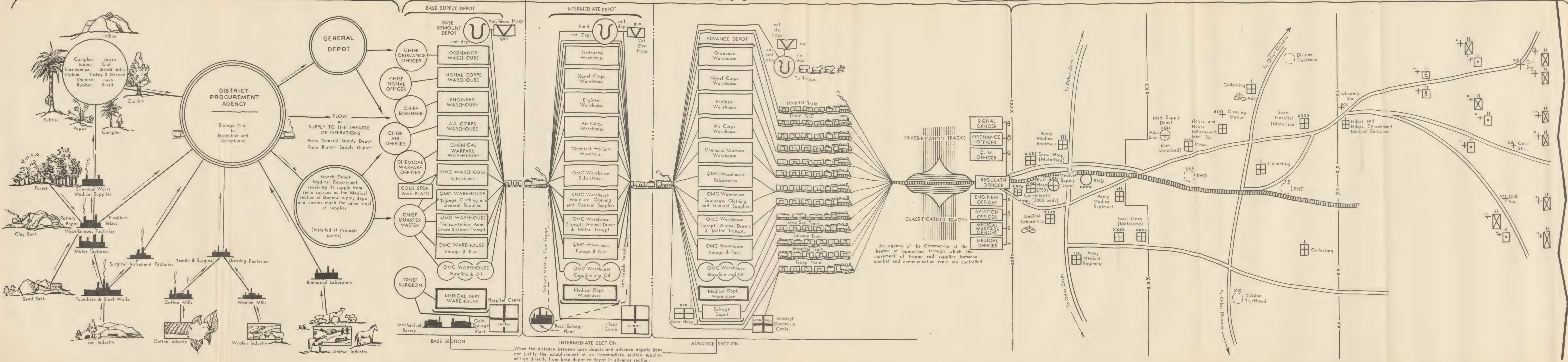
Engineer supply. The company commander is informed by the battalion commander as to where and when engineer field fortification materials will be furnished. Likewise, when additional intrenching tools are to be furnished by the battalion, he is informed of the details of distribution.

Medical supply. During combat, emergency requirements are obtained by informal request to the nearest medical unit.

Other supplies. Other items of class IV supply, such as additional field wire, additional decontamination apparatus, and the like, are obtained by informal requisition, either orally or by message, sent through command channels to the regiment.

Class V Supply. General. Class V supplies include all classes of ammunition, pyrotechnics, antitank mines, and chemicals.

COMBAT ZONE



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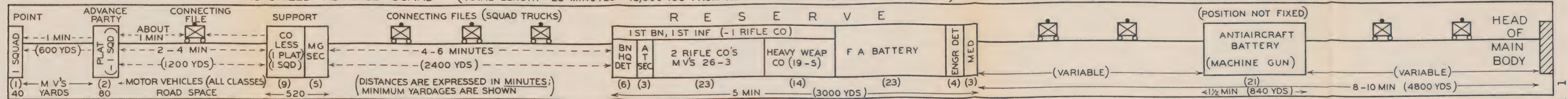
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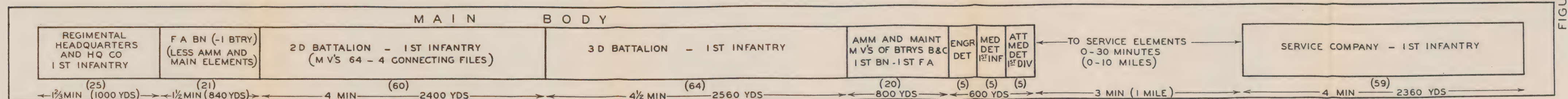
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COLUMN FORMATION, MOTORIZED INFANTRY REGIMENT, TRIANGULAR ORGANIZATION

MOTORIZED ADVANCE GUARD (TOTAL LENGTH - 23 MINUTES - 13,000 YDS FROM HEAD OF COLUMN TO HEAD OF MAIN BODY) ADVANCE GUARD (TAIL) PRECEDES MAIN BODY BY 8 MINUTES

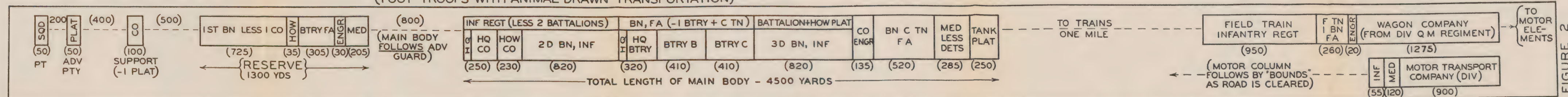


RATE OF TRAVEL: 20 MILES PER HOUR - (ABOUT 600 YDS. PER MINUTE) ROAD SPACE 40 YDS PER VEHICLE ON MARCH - 10 YDS PER VEHICLE CLOSED-UP AT HALT



COLUMN FORMATION INFANTRY REGIMENT SQUARE-TYPE ORGANIZATION

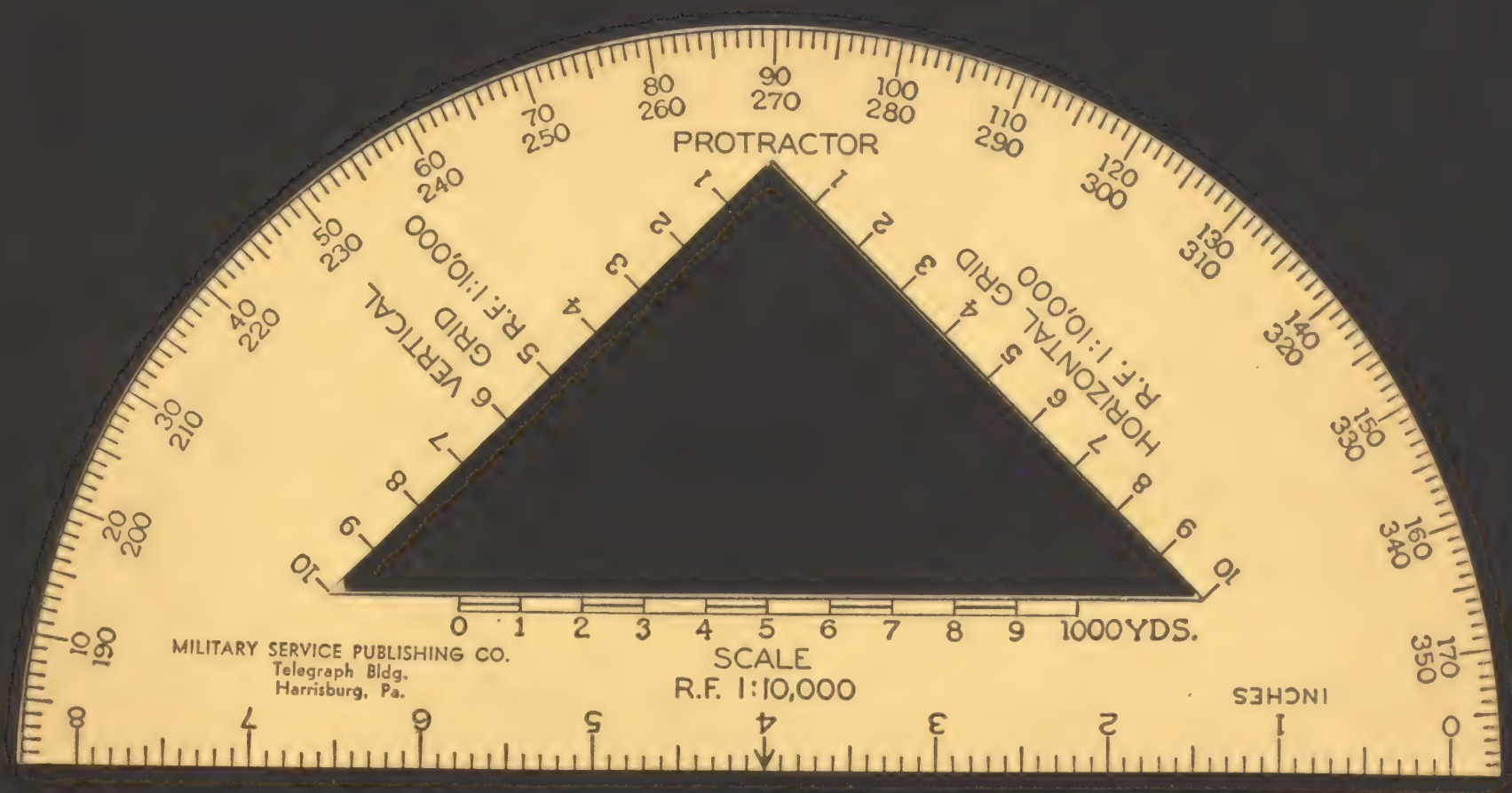
(FOOT TROOPS WITH ANIMAL-DRAWN TRANSPORTATION)

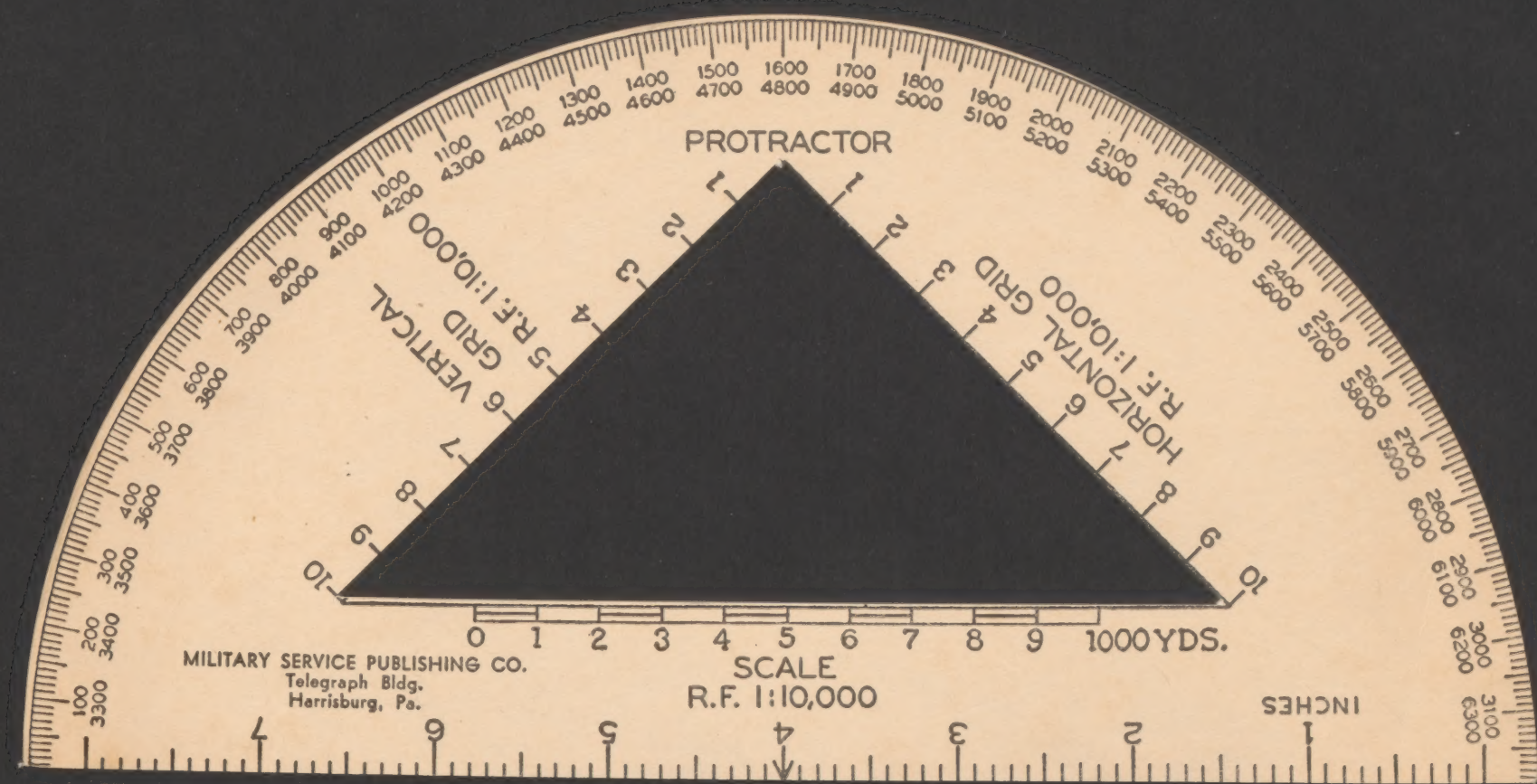


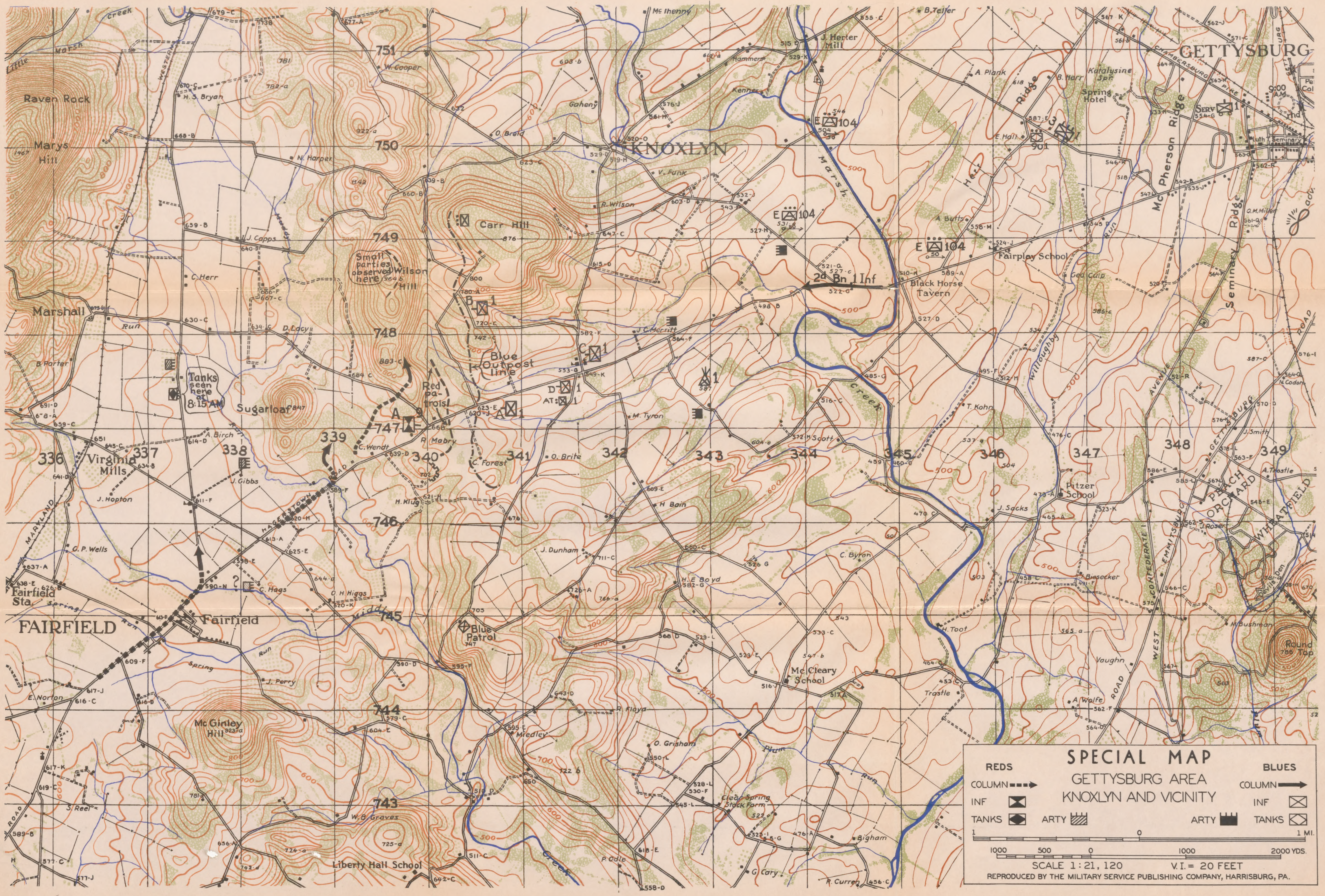
RATE OF TRAVEL: MIXED COLUMN OR FOOT TROOPS: 2 1/2 MILES PER HOUR (88 YDS PER MINUTE); OFF ROADS (3/4 THS TO 1 1/2 M.P.H. ACCORDING TO GROUND, DAYLIGHT, DARK, ETC.)

FIGURE 1


FIGURE 2










REDS


COLUMN 


INF 

TANKS 

BLUES

COLUMN 

INF 

TANKS 

SPECIAL MAP

GETTYSBURG AREA

KNOXLYN AND VICINITY

1 0 1000 500 0 1000 2000 YDS.

SCALE 1:21,120 V.I. = 20 FEET

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SPECIAL MAP "A"



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